THE IRON TRADE REVIEW

VOLUME XXIX. CLEVELAND, O. FEBRUARY 13, 1890. CHICAGO, ILL. NUMBER 7.

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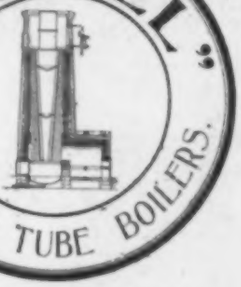

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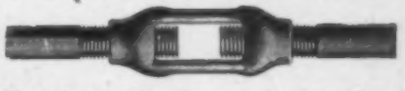
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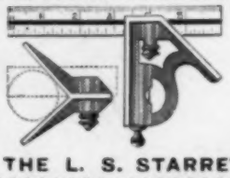
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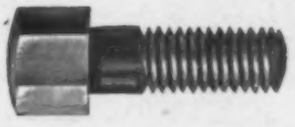
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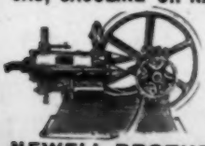
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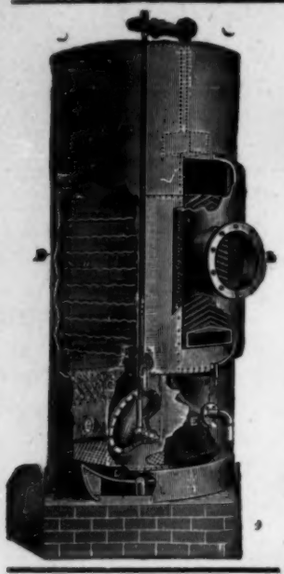

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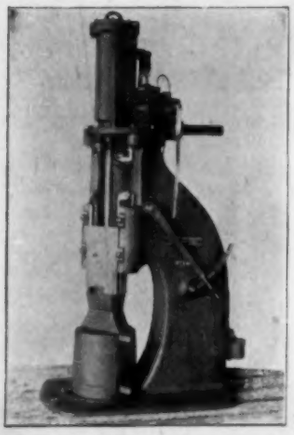

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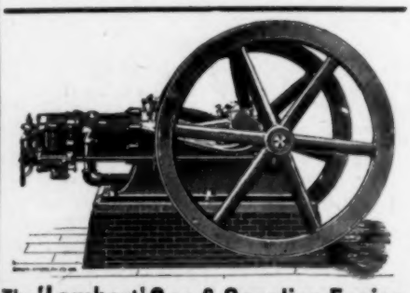

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THE IRON TRADE REVIEW

VOLUME XXIX. CLEVELAND, O. FEBRUARY 13, 1896. CHICAGO, ILL. NUMBER 7.

THE WEEK IN IRON CIRCLES.

THE MARKET AT LARGE.

While there is no pronounced increase in mill tonnage, from week to week, the feeling in the iron market continues hopeful. A significant feature is the general steadiness of prices on finished material, with so many mills only partly employed. The confidence that larger demand is not far ahead serves to hold prices where they are, and mills seem unwilling to make the sharp cuts that might result in fuller order books, wanting rather to be in position to take business at a profit, as the demand grows. Conditions governing the pig iron market have not changed. A production in January in excess of consumption caused some settling of prices on foundry grades, but the lowest prices on Southern irons are not made by the largest interests in that section. The latter are now making sales at Northern points on a basis of $8.50 Birmingham for No. 2 foundry, and $7.25 for gray forge. There has been a better inquiry the past week for foundry irons and buyers who have long been holding off are placing moderate orders. In Bessemer pig there is a better feeling. There is more inquiry in Pittsburg and it is known that some of the steel companies there will be purchasers of metal for April and May delivery. Furnace companies are firm, and while $12.50 in the valley is possible on prompt delivery, little three and four months' business can be done below $13 at furnace. Billets range from $17.50 to $18, later deliveries taking the higher price. Yet some Cleveland business that was closely competed for, brought a bid at $17.25 delivered. Railroad and structural business has some good tonnage in prospect. In addition to a fair amount of rails already booked, there are plans under consideration by several lines that indicate liberal buying in the next few months. Car and locomotive business is also gradually increasing. Reports from the East indicate stationary prices, with more liberal buying of foundry iron. Mills are getting to the point at which more business must be had if even the moderate January pace of operations is kept up; but there appears a general belief that the awaited movement will materialize in time to hold the present basis. A decline in the rate of pig iron production in January, accompanied by increasing stocks promises to be followed in February with somewhat larger production, a number of furnaces idle in January being about to resume, and larger buying will be needed to preserve the relation of production and consumption.

THE CLEVELAND DISTRICT.

Pig Iron.

The situation is still a waiting one. Stocks of pig iron in the valleys increased in January, and but for the idleness of a number of stacks due to strikes, the total would have been of large proportions. The fact that many furnaces will have cheap ore on hand for a number of weeks after the opening of navigation will have a tendency to prolong the period of nearly stationary values in Bessemer iron, unless there should spring up a good demand—much beyond the present rate—for all forms of finished steel. Some inquiry is noted for Bessemer iron, but buyers do not seem ready to pay the price asked by the furnaces, which in most cases is $13 and upwards in the valley. Limited sales for early delivery could probably be made at $12.50, but the feeling is general with furnacemen that it is better to wait than to make contracts reaching into May on any such basis as that fixed by recent speculative sales. It is believed that purchases for April and May delivery will soon be made, but at present there is little actual business. At New Castle one furnace has gone in and another is preparing to resume. The men have withdrawn their demand for extra pay for Sunday labor and the furnace managers take them back as individuals, treating with no committee and recognizing no union. The market for foundry iron shows somewhat more activity, and prices vary with different furnaces. While one maker has sold No. 1 Scotch iron at $12.50 in the valley, $13 is minimum with another. No. 1 strong foundry has sold at $13 and at a trifle less at the furnace. Foundries do not find better prices for their product. Some of them, in fact, with labor 10 per cent higher, pig iron 20 per cent higher, and coke from 30 to 60 per cent higher, according to the distance from the Connellsville region, have even made lower prices than were ruling at this time last year, in the sharpness of competition for some kinds of work. Forge iron is $11 at valley furnace, with very little made. We still quote $14.25 to $15 on Lake Superior charcoal, with little inquiry.

Billets and Rods.

A Cleveland buyer of billets closed for a portion of his requirements last week at $17.25 delivered. There were several competitors, and the above price was from $1 to $1.25 below other bids. The Youngstown steel plant is idle for the present and the Lorain mill is busy on rails, both supply and demand being light meantime. The two or three buyers of wire rods who might come to this market are supplied for the present; the quotation is nominally $23.50.

Finished Material.

The Lake Shore order turned out to be for 2,000 cars. That of the Wheeling & Lake Erie for 1,000 cars is yet to be placed. Of the Lake Shore order the Michigan-Peninsular, of Detroit, got 1,000 and the other 1,000 was divided between Union, of Buffalo, and Madison, of Madison, Ill. The 10 locomotives recently placed by the W. & L. E., went to the Cooke works at Paterson, N. J. Some rail buying by Central Western lines is under negotiation. It is understood that Pittsburg and Chicago rail mills are very busy and have a large additional tonnage in sight. Another boat order is pending—a tank barge that will call for about 1,000 tons

Continued on page 7.

THE CHICAGO DISTRICT.

[SPECIALLY REPORTED FOR THE IRON TRADE REVIEW.]

The market has been rather quiet in most branches in the past week, yet several good sized sales of various classes of material were made, and mill and furnace representatives are inclined to be very hopeful as to the future. The general tone is one of firmness. Several classes of material have been advanced and there is no weakness discernible in any branch of the market. Buyers are inclined to purchase in rather larger quantities than has been the rule for some time past, but they are trying hard to secure extended deliveries on their contracts. Dealers are not anxious to meet them on this point and this, more than a difference in views as to prices, prevents business being very large. It seems probable, however, that buyers and sellers will come to an agreement in this respect and that sales the balance of this month will be in increasing quantities all the time. There is a very large demand for rails, billets, rods, and plates, and the mills of the Illinois Steel Co. have all been started with the exception of the North Works. The Union Works, and South Works are running on billets and rails, and the billet mill at Joliet is also running. The new rod mill at Joliet started up the first of the present week.

PIG IRON.—A number of good sized sales of pig iron were made last week, including one of 2000 tons and several of 1000 tons and smaller of Southern iron, several lots of 1000 tons and less of Northern iron, and an aggregate of considerably over 10,000 tons of Lake Superior charcoal. Prices appear to be rather firmer than they were a week ago both for Northern and Southern irons. The Southern furnaces with the exception of two or three small concerns are holding firmly to the prices given below except when some desirable offer presents itself, and even in such a case only a small allowance is given from these figures. One Southern concern is reported as making very low prices on its products, but it is expected that it will not take long for this furnace to fill up with orders, taking it from the market. The demand for Northern iron continues very fair and a number of good sized orders will probably be closed within the next week or ten days. The large lots of Lake Superior charcoal iron which were sold last week went to malleable and car wheel foundries at figures quite a little under the quotations we give. The following quotations represent as nearly as possible the actual condition of the market at present:

Lake Sup. Charcoal.....	$14 00@14 50	Southern No. 2 Soft.....	$12 10@12 35
Local Coke Fdy. No. 1...	12 75@13 25	South'n Silveries No. 1.	13 35
Local Coke Fdy. No. 2...	12 25@12 75	South'n Silveries No. 2.	12.85
Local Coke Fdy. No. 3...	11 75@12 25	Jackson Co. Silveries...	14 50@16 00
Local Scotch Fdy. No. 1.	12 75@13 25	Ohio Silveries No. 1.....	15 00@15 50
Local Scotch Fdy. No. 2.	12 25@12 75	Ohio Silveries No. 2.....	14 50@15 00
Local Scotch Fdy. No. 3.	11 75@12 25	Ohio Strong Softeners...	15 00@15 50
South'n Coke No. 1.....	12 85@13 10	Alabama Car Wheel.....	17 50@18 00
South'n Coke No. 2.....	12 60@12 85	Malleable Bessemer.....	.....
South'n Coke No. 3.....	12 10@12 60	Coke Bessemer	.....
Southern No. 1 Soft.....	12 35@12 60		

BARS.—There has been a good demand for bar iron and steel from car manufacturers and several good sized orders were placed among this class of consumer within the last week. General business has been very fair and orders for lots of 50 to 100 tons are comparatively frequent. Quotations are made at 1.35c for common iron and 1.40c to 1.45c for guaranteed. Soft steel bars from strictly billet stock are quoted from 1.40c to 1.45c.

RAILS AND TRACK SUPPLIES.—The market continues to be active and a number of small orders were closed up by the local mills last week. It seems probable that the tonnage for this year will be very much in excess of that for last year, as a number of the Western roads will have large needs to fill at some time during the year. Quotations are unchanged as follows: Rails, $29 and up; splice bars, 1.65c to 1.75c; track bolts, 2.25c to 2.45c; spikes, 1.85c to 1.90c.

BILLETS AND RODS.—The Union Works and the billet mill at Joliet started up last week on billets and the Joliet rod mill started up on Tuesday of the present week. Some small sales of billets were made at $19.50 to $20. Rods are quoted nominally at $27 to $28. A very large demand is noted and it is probable that a number of large sales will be closed up in the near future.

STRUCTURAL MATERIAL.—Two large contracts were closed last week by a Pittsburg mill; one for an addition to the Ashland block, requiring several hundred tons, and one for the Trude building taking about 1,000 tons. Other large contracts are expected to materialize within a short time. General business has been very good and the inquiry is increasing every week. Prices are made as follows: Beams and channels, 1.65c to 1.75c; angles, 1.50c to 1.55c; plates, 1.60c to 1.65c; tees, 1.65c to 1.75c. Small lots from stock are quoted ¼c to ½c higher.

PLATES.—A number of round lots were sold last week by the local mills and the demand appears to be increasing. Quotations are unchanged as follows: Tank steel, 1.60c to 1.65c; flange steel, 1.85c to 1.90c; fire-box steel, 2.85c to 5c; boiler tubes, 60 to 65 per cent discount.

MERCHANT STEEL.—Business in the past week has been very good with all of the dealers in this market and the total sales aggregate a considerable tonnage There are still a number of inquiries unsatisfied and it seems probable that the trade will be good for some time to come. Prices are maintained as follows: Open-hearth spring, tire and machinery steel, 2c to 2.10c; smooth finished machinery steel, 1.75c to 1.80c; smooth finished tire 1.65c to 1.70c; tool steel, 5.50c to 7.50c; specials, 11c and upwards; Bessemer bars, 1.55c to 1.65c.

SHEETS.—Nearly all of the mills have advanced prices within the past week, although there are a few willing to sell at quotations under those given. The demand has been excellent and several large orders for both black and galvanized sheets were placed last week. The local mills quote No. 27 black at 2.40c to 2.45c and galvanized at 75 and 10 to 75 and 5 per cent discount.

OLD RAILS AND WHEELS.—A sale of 750 tons of old wheels is reported at $14. The demand for old wheels is large and is apparently in excess of the supply. Old iron rails are quiet at about $15 50 to $17. Old steel rails are quoted at $10.50 to $12, according to length, etc.

SCRAP.—Dealers report a better demand and larger sales than have been made for some time past. The situation is very much improved and it is expected that business will be better from this time on. The following are buying quotations furnished by dealers: Railroad forge, $10.50 to $11; dealer's forge, $10; No. 1 mill, $6; railroad cast, gross ton, $9.50 to $10; machinery cast, $10 to $11; axles, $13; cast borings, $4; wrought turnings, $5; axle turnings, $5.75; mixed steel, $9; stove plates, $4; heavy melting steel, $10.50.

IN OTHER MARKETS.

[SPECIALLY REPORTED FOR THE IRON TRADE REVIEW.]

Pittsburg. While last week was undoubtedly one of the dullest of the present year, so far as Bessemer pig iron and steel are concerned, there is today an improved outlook for Bessemer pig and a better inquiry. The steel mills are not buying, as yet, but there have been offers, indicating that March, April and May requirements are being considered. It has been well un-

derstood that the meager business of the past few weeks has been for the most part done by middlemen and that the iron was taken for spot or early delivery. There is a difference of opinion as to the market price, and from $12 50 to $13.25 in the valley is the range of prices named on iron for delivery in the next three or four months. As the deliveries near the time of new ore the price is higher. A 2,500-ton Pittsburg transaction in Bessemer was made at $13, but no valley sales at the corresponding figure, $12.25. Foundry iron and gray forge are unchanged. The former are quoted $13@$13.25 for No. 1, and $12.50@$12.75 for No. 2 A sale of 500 tons of gray forge is reported at $11 here, and a sale of 500 tons at $11 in the valley. The demand for forge is fair, and the supply is limited. Billets are quoted from $17.50 to $18, with mills reluctant to take three months' contracts below the latter figure. A sale of 1,500 tons is reported at $17.50 at maker's mill, and a sale of 1,000 tons at $17.75 at Wheeling, deliveries extending through May, and one of 1,000 tons February and March, at $17.50, Wheeling. In general, the demand for finished material has not received the awaited stimulus, yet in several lines there is more than a moderate tonnage booked. Some plate mills are quite well supplied with orders, and the amount of structural material placed is not insignificant, while the contracts talked about run well up. While there is here and there a shading of figures where Eastern and Pittsburg mills are competing closely, the figures heretofore quoted are generally maintained—1.35c to 1.40c for tank steel, 1.45c to 1.50c for shell and 1.55c to 1 60c for flange. On beams and channels 1.50c is still the basis for widths to 15 inches; angles 1.25c to 1.30c; tees 1.45c to 1.50c. The business in iron and steel bars is far from enough to go around; yet there is little cutting on steel below 1.15c. On iron 1.20c delivered in the Cleveland and valley districts is the quotation on common. There is a possibility of a $1 per ton advance, if the Merchant Bar Iron Association is put on the proposed new basis. Sheets are unchanged, with some mills firmer, on later deliveries. A gradually increasing inquiry is noted in iron and steel pipe and spring business is expected to develop soon. The base discounts heretofore prevailing take four 10s. For boiler tubes 2¼ in. and smaller, 75 per cent discount is quoted and on tubes 2½ in. and larger, 75 and 10 per cent. Old material shows a better movement. Prices are not uniform, however. A sale of No. 1 railroad wrought scrap is reported at $12.75 per net ton; 1,000 tons of old iron rails at $16.50; 1,000 tons of old car wheels at $12.25. Old steel rails are quoted $13 to $13.25. There is more activity among railroads. Rail tonnage talked of is of good proportions, and several orders are now pending. Car and locomotive buying is increasing.

Cincinnati. Business keeps up well, and the sales of the past week aggregate a large tonnage. The activity among manufacturers is not general. Some are very busy, some are only fairly so, while quite a number report trade dull. The demand for Southern irons, which in foundry and puddling grades is such an important element in the West, South, and Central Northern States, has been heavy since the first of the year, and while prices have not appreciated, the market is firmer. Northern coke irons are irregular in price, owing to the varied conditions prevailing at the furnaces. Those in possession of an ample supply of cheap ores and fuel, and pessimistic as to the future, are selling at lower figures than the furnaces short of ore and paying current prices for coke. The iron rolling mills are only moderately active and the car works report no increase of orders for cars. The marked improvement in the demand for pig iron is owing partly to the quietude of the closing month of 1895, during which period stocks in the hands of consumers were depleted, a present animation of general business and a sanguine belief in a better future. The wonderfully successful government bond sale emphasizes the expectation of improved business in the assurance of an abundance of money awaiting investment and use when confidence prevails and there is reliable promise for security.

St. Louis. The improved condition of the iron market continues and the demand is increasing. The numerous small orders for quick shipment from foundries of all descriptions is a healthy sign. Prices of Southern pig iron have strengthened considerably during the past week.

Philadelphia. Some large lots of coke iron have been sold this week. Sales aggregating 30,000 tons have been made to foundries taking tide water deliveries. The demand for finished iron and steel is much better, heavy contracts having been closed this week for structural iron and steel which now enters so largely in every new building. Coke is firmer at the new schedule and reports from Pittsburg show a good demand for mill iron.

Buffalo. There is a larger inquiry and a considerable increase in actual transactions, sufficiently general and scattered to suggest the possibility of another buying movement having set in. Several negotiations have developed the fact that there exists a well defined bottom, below which furnaces will not go. Present quotations are at $13.50 for No. 1 strong foundry, all Lake Superior ore, and $13 for No. 2; Lake Superior charcoal, $14 50 to $15.50.

Turning Chilled Rolls.

Those who have essayed turning chilled rolls for the first time have not been pleased with the experiment, nor usually satisfied with their success. It is an art in itself; an art which perhaps the late Morton Poole, of Wilmington, Del., did more than any other one man to bring to perfection—and to perfection he certainly brought the grinding of chilled calendar rolls for paper-making. Before, however, the grinding operation is commenced, there must be as nearly perfect work done by the lathe as it is possible for such an imperfect machine tool as a lathe to perform; but most tools for this work have the double disadvantage that they do not do good work and do not work fast enough. But by the use of a simple tool the work is rendered very easy, and its quality—for lathe work—leaves nothing to complain of.

A plain bar of tool steel is taken, about 1¼ inches square; about four inches of it cut off, and then fluted on each side with a semi circular channel of about ⅜-inch radius. All four sides of the bar being then ground so that the four angles are exactly 90 degrees each, the tool is ready to be clamped in the tool-holder and set to work. It does not remove curls of material, but takes off a series of brittle, thread-like turnings, about the size and general shape of pine needles. When one band four inches wide is turned, the tool is moved along. —["G" in American Machinist.

THE Pewabic Co., Iron Mountain, Mich., has added considerably to its working force the past month and is now making a daily output of 1,250 tons. Small forces of men are being worked by the company at the Walpole and at the Saunders. The pumping plant displaced at the Pewabic by the new Worthington pump will be moved to the Walpole, which is near the Chapin, and the shaft will probably be deepened.

TIN plate exports from Wales to the United States have steadily decreased in the past five years. The showing is as follows: 1891, 325,143 tons; 1892, 278,477 tons; 1893, 255,609 tons; 1894, 226,880 tons; 1895, 222,901 tons.

THE IRON TRADE REVIEW

DEVOTED TO

IRON AND STEEL MANUFACTURE, FOUNDRY AND MACHINERY TRADES, IRON ORE PRODUCTION, TRANSPORTATION, AND GENERAL INDUSTRIAL PROGRESS.

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THE BESSEMER ORE ARRANGEMENT.

We find these comments on the proposal to allot the output of the Bessemer-producing mines of the Lake Superior region:

The statement from the iron ore regions that the pool has made allotments of the ore production, limiting the total to 10,500,000 tons, should be instructive to the country. This is a plain statement of the combination policy that if iron manufacturers succeed in expanding the markets so as to increase their output, they shall not have the ore to do it. In other words, the aim of the combination is to stop the increase of industries in pursuance of the great project of squeezing more than competitive prices out of the ore. It is certainly to be hoped that the opinion may prove true, as expressed in connection with this report, that "this attempt to regulate the entire steel output of America may not be successful."—[Pittsburg Dispatch.

It seems to be now pretty well settled that a combination agreement has been reached, by which the output of iron ore from the Mesabi range will be controlled, and its price kept to about the competitive price of iron ore which has to be mined by the usual laborious and expensive methods, instead of being simply shoveled on to cars by steam shovels, as the Mesabi ore is. Thus, this arrangement of Nature, by which mankind might derive the benefit of cheap raw material for one of our most important products, is made to benefit a few monopolists only.—[American Machinist.

If only exact statements were printed concerning the proposed agreement as to Lake Superior Bessemer ores, there would be no call for editorial expressions like the above. The assertion in the first paragraph quoted, that the iron manufacturers who may succeed in expanding their market will not have the ore to do it, is as far from the truth as it can get. If proof were needed on this point, the action of the ore-selling companies last year in providing for the additional mid-season demand of furnacemen by increasing production is sufficient. It may be remarked, in the same connection, that some of this demand has proved since to have been an effort by a few producers to get a large supply of ore at the expense of others; some seeking to cover their probable needs well into the navigation season of 1896.

The prediction may safely be made that the available supply of Lake Superior Bessemers in 1896 will not be allowed to fall below the demand. The mining companies are in business to sell ores, and it would be a peculiar departure from the history of the business if a demand should come up which sellers were unwilling to supply. There is a distinction, which the iron mining and blast furnace interests have had emphasized by experience, between a production that has no regard to demand, and that through a pell-mell campaign for tonnage, piles up a huge surplus and eliminates profit, and a production that carefully regards the requirements of trade and so adjusts itself to these requirements that profit is possible to capital and fair wages to labor.

The statement contained in the second paragraph, that the plans of Nature for giving mankind cheap Mesabi ore, are not regarded by the proposed ore arrangement, is answered by the Mesabi producers themselves. For three years "mankind" has been getting cheap, very cheap, Mesabi ores, at the expense not only of Mesabi investors but of mining capital and labor on every other Lake Superior range. Hundreds of thousands of dollars have been lost on the Mesabi by the original investors, and it is not so very long since soup houses and relief committees were an institution on the Gogebic range, because "mankind" was reaping the first fruits of the stories of fabulous supplies of Mesabi ores, with a mining cost equivalent to the cost of scooping up dirt. It certainly argues that Nature has not given all the good things to the Mesabi range, that the mining companies on that range are willing to change the policy under which they have operated heretofore. High royalties and ores with physical characteristics that have limited their use, are facts familiar to the iron trade, if they are not grasped by others. Without going into a discussion with which the ore trade and the furnace interest are quite familiar, it is sufficient to say that the Mesabi's ability to produce cheap ores has been grievously exaggerated to its hurt, as has its ability to market its product. On these two statements hinges much that is overlooked by those who are still gauging the new range on the basis of the "steam-shovel" literature of its early days. The fact seems to be that Mesabi producers have concluded that "mankind" will not save them from ruin if they do not arrange to get back cost and something more on every ton of ore they send to market.

A GAIN IN OUTER TRADE.

While statistics have not always had appreciative words from those most indebted to them for arguments upon economic questions, there is no other recourse but to figures when it is desired to take the measure of forces at work in altering the trend of commerce. The trade of the United States with foreign nations has had no little attention in the past few years. The character and amount of imports and exports have been studied for their bearing on the disturbing questions of finance and revenue; and in view of the organized movement among our manufacturers for better facilities for selling and shipping to the outside world, the record of our export operations in recent years has had careful scrutiny. It is gratifying to know that in the calendar year 1895 there was considerable increase in the value of iron and steel and their manufactures exported from the United States. This is represented by a total of $35,071,535 last year against $29,943,729 in 1894, or more than $5,000,000 increase, 1895 being the banner year in iron and steel exports. In the table below the figures for the past three years are given, showing in what lines the changes have been most marked:

EXPORTS OF DOMESTIC IRON AND STEEL.

	1895.	1894.	1893.
Scrap iron	$8,725	$.....	$.....
Pig iron	371,297	309,221	379.437
Band, hoop and scroll iron	8,169	5,380	10,467
Bar iron	147,798	130,374	94,239
Car wheels	113,195	113,172	117,443
Castings, n. e. s.	751,664	484,675	504,893
Cutlery	170,166	160,879	173,779
Fire-arms	845,110	640,099	704,569
Ingots, bars and rods of steel	117,250	50,911	27,743
Locks, hinges and other builders' hdwe	2,706,532	2,452,732	2,495,099
Saws and tools	2,012 030	2 019,199	1,886,090
Machinery, n. e. s.	12,115,118	10,715,520	10,512,576
Fire engines	2,145	22,138	1,700
Locomotives	2 110,244	1,567,464	1,815,017
Stationary engines	192,985	257,350	295,989
Boilers and parts of engines	436.091	582,683	574,612
Cut nails and spikes	339,825	331,143	282,176
Wire nails, wrought, horseshoe, tacks	239,610	196,165	173,275
Plates and sheets, iron	32,170	111,580	92,675
Plates and sheets, steel	60,889	53,641	35 885
Printing presses and parts of	217,678	160,303	314,563
Rails, iron	139,470	32,306	5,059
Rails, steel	222,661	323,880	590,929
Scales and balances	387,710	292,055	374,419
Sewing machines and parts of	2,988,006	2,164,787	2,456,487
Stoves and ranges and parts of	289,462	240,936	235,796
Wire	1,375,195	1,304,794	1,006,014
All other mfrs. of iron and steel	6,610,370	5,320,335	5,000,430
Total	$35,071,535	29,913,729	30,159 363

Machinery is of course the chief factor in the export trade, the gain under this head, including stationary engines, locomotive and fire engines, boilers, etc., being about $1,700,000 over 1894. The activity in mining in South Africa is shown in shipments of $1,191,797 to Africa last year, as compared with $441,015 in 1894. Our machinery business with Europe outside of the United Kingdom, Germany, and France, increased from $757,549 in 1894 to $1,221,246 last year; with Mexico, from $1,682,492 to $2,029,780; with Brazil, from $1,283,592 to $1,596,540. Machinery trade with Cuba, on the other hand, fell from $1,916,061 to $505,628.

Other items of interest to the iron trade, as they appear in the export exhibit, are agricultural implements and cars, carriages, etc. In implements, there was an increase to $5,319,885 from the $4,765,793 total of 1894. There was a gain of about $1,000,000 in the implement trade with Continental Europe and the United Kingdom, from $2,139,951 in 1894, to $3,102,468 in 1895. Financial troubles in Argentina, which caused a drop in our implement exports to that country from $1,703,239 in 1893 to $1,202,934 in 1894, brought a further decrease to $737,297 last year. Carriage and street car exports were $1,601,010 in 1894, and $1,626,402 in 1895. The number of steam cars exported increased from 1,610 in 1894, to 1,682 in 1895, and their value from $696,366 to $1,021,865.

WITH a 25 per cent wage reduction at some works, and many idle altogether, the Welsh tin plate situation is growing steadily worse. In the United States the mills are not only holding last year's trade but gaining on it, with the help of cheap contracts for steel.

SOME features of the statement of iron and steel imports to the United States in the 12 months ending Dec. 31, 1895, are worthy of mention. The iron ore imports, as is well known, ran up rapidly in the second half of the year. December, for example, showed 102,687 tons received at Atlantic ports, as compared with 15,764 tons in the preceding December and only 168,541 tons in the entire year 1894. For 1895 the total was 524,153 tons, and but for the Cuban war this might have been swelled considerably. Leaving out ore, the value of imports of iron and steel and their manufactures for 1895 was $25,772,151, an increase of about 25 per cent over 1894, when the total was $20,843,576. It will be seen from the table below, that the tin plate imports have been practically the same in each of the two years; that pig iron, scrap, bar iron, ingots, and cotton ties largely exceeded, last year, the totals for 1894. Sheets and plates fell off 50 per cent, due in large part, doubtless, to the restricted importation of black plates for tinning:

	1894. Tons.	1895. Tons.
Pig iron	15,582	53 232
Scrap iron and steel	2,380	5,066
Bar iron	9,228	20,004
Rails	300	1,447
Hoop, band, or scroll iron	855	15
Ingots, blooms, etc.	9.494	26,255
Sheets, plates, etc.	28,795	14,535
Cotton ties	5	3.485
Tin and terne plates	215,067	219.545
Wire rods	22,607	26,833
Wire	4,287	5.773
	308,600	377,190

Manufacturers of iron and steel, including anvils, chains, cutlery, files, firearms, needles, machinery, shotgun barrels and "all other," are included in the total valuations mentioned above. These items in 1895 amounted to $7,797,003, against $4,457,855, so that they contribute the bulk of the increase of about $5,000,000 over the 1894 valuations.

THE CLEVELAND DISTRICT.—Continued from Page 3

of plates and shapes. The contract is expected to be placed in the near future. Some small plate orders have been given the past week, and while Pittsburg mills seem to be uniform on a 1.35c minimum for tank steel, a Cleveland order was taken at a price close to that figure delivered. One Pittsburg plate mill is naming 1.40c on open-hearth plates, prompt delivery. Structural material is quiet, but Pittsburg mills closed a good tonnage in January and are firm in prices. We still quote 1.49c Cleveland, on beams and channels. In bar iron little is doing. The Western Bar Iron Association is now in session in Cleveland—the third three-days meeting in three weeks—and there is no definite outcome as yet to the pooling plan. The association price is 1.25c Cleveland, as against 1.20c in January, but this is cut from $1 to $3 by outside mills. Old material is fairly active. A sale of 1,000 tons of old iron rails at $16.50 Cleveland, is reported, and of No. 1 railroad wrought scrap at $12.

American Institute of Mining Engineers.

The local committee for the Pittsburg meeting of the American Institute of Mining Engineers, Geo. H. Clapp, secretary, has prepared the following programme of sessions and excursions:

Tuesday evening, Feb. 18, opening session, with address of welcome. Wednesday at 9 A. M., train leaves union station, P. V. & C. R. R. for the Homestead plant of the Carnegie Steel Co. Arrive at 9:30 and leave at 11:30 for Duquesne. Leave Duquesne at 1:00 P. M., going to East Pittsburg, where lunch will be served at 1:30. From 2:30 to 3:30 will be spent at the works of the Westinghouse Electric & Mfg. Co. At 3:45 the train will leave for Pittsburg, arriving at 4:30. Evening, session of the institute. Thursday will be given up to morning and afternoon sessions of the institute. Banquet in the evening.

On Friday, train leaves union station, P. R. R., 9:00 A. M. for Jannette, and the glass works of McKee & Bro. will be visited. At 10:45 leave for Latrobe, to visit Latrobe Steel Works, where lunch will be served. Leave at 1:30 via Blairsville Intersection for the Pittsburg Plate Glass Co.'s plant at Ford City and the Pennsylvania Salt Mfg. Co., at Natrona; returning, arrive at Allegheny 5:00 P. M.

The committee has arranged also a series of alternate excursions, that can be taken, where parties are formed, any time during the meeting, as follows: Youghiogheny Coal Co., electric hauling, mining, etc.; Edgar Thomson Steel Works, rails; relief model of the proposed Pittsburg & Erie Canal; U. S. Glass Co., window glass; oil wells, gas wells, gas pumping plants, etc.; Otto Hoffman coke ovens, Frick Coke Co., foundries, rolling mills, Carnegie Library and Phipps Conservatory. For the alternate excursions members will be furnished with cards of introduction to the various works they may visit, and where parties are organized guides will be provided.

ROLLING-MILL FEED TABLE.

General Manager John A. Potter, of the Cleveland Steel Co., has perfected a new rolling-mill feed table, the construction of which is shown in the accompanying cuts. Simplicity of design, cheapness and efficiency are among its points of advantage. Another feature is the provision of a plate, on which the rollers travel, which keeps currents of air from striking and chilling the hot metal piece. Further, the rollers being of small diameter and of small mass, do not deprive the metal of heat by conduction to the same extent as do the rollers of feed tables now commonly employed. These points are especially advantageous in a table employed in the rolling of plates or sheets, whose rapid loss of heat is ordinarily a troublesome factor in rolling operations.

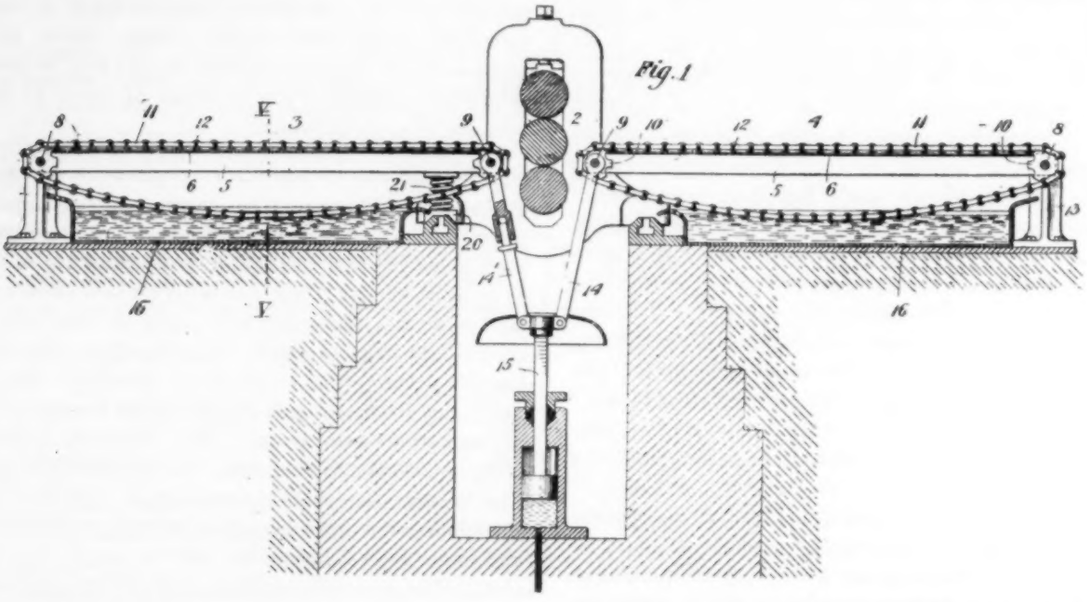


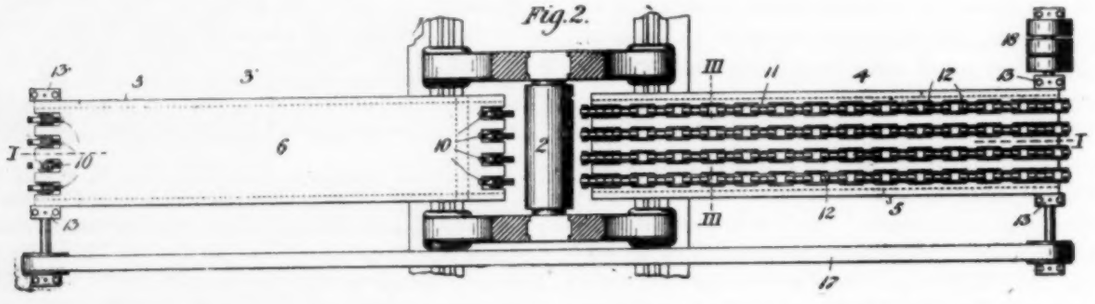
Fig. 1 shows the improved feed tables applied to a rolling mill. The view is a vertical longitudinal section. Fig. 2 is a plan view, partly in horizontal section. The rolls and housings are designated by 2, and 3 and 4 are the feed tables, constructed as follows:

The table is made up of side beams 5 and a horizontal top plate 6, which may be fixed together and suitably braced by tie-rods. At each end of the table is a cross-shaft 8 9, carrying a number of sprocket-wheels 10, around which pass endless chains, extending lengthwise of the table. At the joints between the links of each chain are journaled rollers 12, which travel upon the top plate. These rollers are of small diameter, preferably about one inch and not more than about four inches, and the rollers of each transverse line are separate from each other at their ends.

In order that the tables may be vertically movable where vertical movement is required, the rear end of each table is pivoted on the axis of its shaft 8 in supports or standards 13, and the front end of the table connected by a link 14 or otherwise with a lifting-ram 15, set in vertical position beneath the rolls and between the tables, and by vertical motion of this ram the tables may be moved together from the lower to the upper pass of the rolls, or vice versa. Beneath each table is placed a pan 16 containing water, so that whether the table is in lowered or in raised position the chains resting in the water are cooled and are washed from scale. The sprocket-chains are driven by means of suitable connecting mechanism, it may be by a belt 17 and pulleys 18, from a main driving engine. As shown in the drawings, this mechanism is constructed so that the chains may be driven in either direction, and so that by their reversal the metal may be passed back and forth between the rolls.

In using the tables to deliver metal to the rolls or to carry it therefrom the sprocket-chains are driven, causing the rollers to travel over the surface of the plate 6. The metal piece 19 is placed upon the rollers, and as the latter, by reason of their rotation upon the plate, have a greater surface speed than the chains, the metal is moved along the table at like greater speed toward or from the rolls, according as the chains are driven in one direction or the other. Rapid travel of the metal can thus be had with a slow travel of the sprocket-chains. The metal piece can thus be delivered to the rolls and passed back and forth between them, and by means of lifting mechanism employed when the tables are used with three high rolls, it can be made to pass alternately through the upper and lower passes in the usual manner.

Both tables 3 4 are connected by the arms 14 14′ to the same lifting-ram 15, so that both are raised simultaneously. It is desirable that one of the tables 3 should not have such long motion as the other table 4, so that when the tables are in their lowest position the delivering-table 3 may be a little higher than the receiving-table 4, and that when they are in elevated position the then receiving table 3 shall be a little lower than the then delivering table 4. To effect this the arm 14′ is made in two parts telescoped together or otherwise arranged so as to be capable of some loose longitudinal motion, this arm being also somewhat shorter than the arm 14, and at the desired limit of down motion of the table 3 are placed a supporting block or stop 20 and a cushioning-spring 21. When the table reaches this stop it rests upon it, and the lifting-ram, by reason of its loose joint, continues to descend, so as to carry the table 4 down into a lower position.



THE Stewart Iron Co.'s muck mill, at Sharon, Pa., has shut down and will remain idle for the present.

VALUE OF RAW MATERIALS IN IRON MAKING.

At the last meeting of the Alabama Industrial and Scientific Society, the proceedings of which have just been published in pamphlet form, Dr. Wm. B. Phillips, of Birmingham, read an interesting paper on "The Value of the Raw Materials in Iron Making." The author showed from a statement of present conditions in the Birmingham district what great importance was attached to the analysis of raw material to-day, by the great iron producers. He compared these conditions with those of a few years since, and stated that it was exactly 30 years since the first laboratory was established in connection with a blast furnace. By the use of statistics based on the data obtained from an ore containing 40% of iron, 35% of silica and alumina (reckoning the small amount of alumina as silica; in actual practice the silica is to the alumina as 1 to 0.87), and 0.50% lime, he showed the difference in the cost of iron making and the advantage resulting from the use of high grade raw material. In this connection he gave the rise of the iron and the fall of the silica and alumina in ores ranging from 40% iron, 35% silica plus alumina, to 60% iron with 5% silica plus alumina. He stated that while the ratios he indicated, between iron and silica plus alumina were not absolutely correct, yet they were near enough for present purposes. He said that it was a general rule for the soft ores of the Birmingham district that as the iron gains one per cent, the silica plus alumina falls 1 50 per cent.

The writer then discussed the subject of the coke used in the furnace, and the limestone, showing by comparative statements the advantages possessed by higher grades over lower. From these figures he gave the cost of the production of pig iron, with the following conclusions: The burden based on a 40% iron and 35% silica plus alumina he calculates as: 2.50 tons of ore at 60c, $1.50; 1.50 tons (3,000 lbs.) coke at $1.75, $2.62; 1.97 tons of stone at 60c, $1.18; total, $5.30. Omitting the intermediate proportions between 40% and 50%, we find the cost on a burden based on a 50% iron and silica plus alumina 20%, to be as follows: 2.00 tons of ore at 60c, $1.20; 1.25 tons (2,500 lbs.) coke at $1.75, $2.18; 0.98 tons stone at 60c, 0.56; total, $3.96. According to the values here taken for the raw material a pound of coke is worth $0.00089; a pound of ore $0.00027; and a pound of stone $0.00027. Comparing the cost of making iron, so far as concerns the raw materials, with a 40% ore and a 50% ore, we find a saving in the use of the latter of $1.34, made up as follows: 500 lbs. coke, 43c; 1,120 lbs. ore, 31c; 2,240 lbs. stone, 60c; total, $1.34. From these conclusions the writer advocated the purchase by the furnacemen of all raw materials on the unit basis, which has been adopted with regard to a portion. Limestone and dolomite are bought on the unit of silica; coke is sold on the unit of ash. A large amount of brown ore and soft red ore are sold on the unit of iron, and there is no good reason why the principle should not be extended to the ores at present bought by the ton.

The concluding portions of Dr. Phillips' paper are as follows:

"A considerable claim for the improvement in iron making here has been made within the last two years, and we are now disposed to insist that the practice is much better than it was in 1893. This is true, and I do not think that any single circumstance has contributed more to this desirable result than the attention that has been paid to the improvement in the raw materials. We have better ore, better coke, and better stone, and the methods adopted for the utilization of these things are themselves better than two years ago. But admirable as have been the advances there is room for still further advances. The inspection of the stock is much closer than it was in 1893, but it does not yet go far enough. A considerable amount of material is bought on analysis, but there is no reason why all the materials used should not be bought in the same manner. Limestone and dolomite are bought on the unit of silica, coke is sold on the unit of ash, a large amount of brown ore and soft red ore is sold on the unit of iron, and I see no reason why the principle should not be extended to all ores at present bought by the ton. We hear a great deal said about the irregular stock, and doubtless there is reason for the remarks. How is the evil to be corrected? Either by the stocking of large amounts of ore, coke, and stone, and the thorough sampling and analyzing such stocks, or by the furnace companies mining their own ore and thus controlling the nature of the output, or by the purchase of materials on the unit system, or by a combination of these plans. It seems to me that the simplest and most satisfactory plan would be to purchase by the unit, as is already done with brown ores, limestone and dolomite.

"One can readily see why the miners would object to such a plan, for it costs less to mine soft red ore of 43 per cent iron than the same ore with 48 per cent iron. More of the seam can be taken and the cost per ton of ore is less the greater the output from each laborer. But a ton of ore with 43 per cent iron carries only 963 pounds of iron as against 1,075 pounds with 48 per cent iron. The cost to the furnace per ton of ore is the same no matter whether this ton carries 43 per cent or 48 per cent of iron. It costs the furnaceman more to make his iron from a 43 per cent ore, and it appears that he should pay less for it, just as he should pay more for a 48 per cent ore, inasmuch as it costs him less to make a ton of iron from it. If a 48 per cent ore is worth 60 cents at the furnace, a 40 per cent ore cannot be worth 60 cents also. It is a contradiction in terms. The present system would be fairer if a reasonable amount of the ore was of the better grade, but this is not the case. The variations in the ore approach the lower limit, and as a general rule the ore is nearer the 43 per cent than the 48 per cent mark. The subject is most fruitful of discussion, and I trust that these very brief remarks may induce some of those interested to look further into it."

Germany's Pig Iron Production in 1895.

We have received from Dr. H. Rentzsch, the statistician of the Association of German Iron and Steel Manufacturers, the statistics of the production of pig iron in Germany and Luxemburg in 1895. The total production was 5,788,798 metric tons, against 5,559,322 tons in 1894. The remarkable growth of the pig iron industry of Germany and Luxemburg since 1870 is given in the following table:

Years.	Metric tons.	Years.	Metric tons.
1870	1,391,124	1883	3,469,719
1871	1,503,682	1884	3,620,612
1872	1,988,394	1885	3,687,434
1873	2,240,574	1886	3,528,657
1874	1,906,262	1887	4,023 953
1875	2,029,389	1888	4,337,121
1876	1,846,345	1889	4,524,558
1877	1,932,725	1890	4,658,450
1878	2,147,641	1891	4,641,217
1879	2,226,587	1892	4,937,461
1880	2,729,038	1893	4,986,003
1881	2,914,009	1894	5,559,322
1882	3,380,805	1895	5,788,798

Of the production in 1895, more than one-half, or 2,898,476 tons, was Thomas iron. Only 444,495 tons were Bessemer pig iron.—[Bulletin.

Ball Bearings and Friction.

It is pointed out by Dr. Coleman Sellers that one of the most notable examples of ball bearings, now growing in vogue, is the diminishing of the friction of the collar sustaining the hooks of a large crane. Thus, by making the crane hooks with flat washers, between which numerous small balls are placed, resting upon hardened surfaces, there seems to be no difference between the friction of rest and the friction of motion, and hooks heavily loaded are turned with remarkable ease; in fact, the use of balls distributed over plain surfaces is becoming a settled practice, there being no basket or grooves to separate the balls, as the latter are allowed to move at their own tendency, that is, in whatever may be their inclination. As to the size of the balls adapted to different purposes, various experiments show interesting results. In the case of hooks for cranes carrying about fifty tons, between 250 and 300 balls each of three-eighths inch diameter, are scattered between the flat plates, on the assumption that the more points of contact the more lasting the belts; but some tests made with balls of different sizes, and motion kept up under loads to determine their durability, favor larger balls and fewer of them.—[Chattanooga Tradesman.

THE Hartford Steam Boiler Inspection & Insurance Co.'s statement at the beginning of the year shows total assets of $2,013,186.46 and surplus, as regards policy holders, of $733,270.59. The company is recognized as the leading one in it its line of business.

LAKE SUPERIOR IRON MINES.

One thing we have noticed at many of the iron mines visited is that the ores which were Bessemer in the upper levels are high phosphorus ones in the lower levels. We can cite many instances where this is the case at the best mines of the different ranges. Whether this is due to the action of percolating waters or not, we will not pretend to say, but that the phosphorus is getting too plentiful for the ease of mind of many of the mine owners we do know. It is one of the reasons why the ores of Bessemer grade should not be thrown away, even if they are close to surface and can be readily obtained.—[Iron Ore, Ishpeming, Mich.

The Minnesota Iron Co. has closed a contract for a lease from the firm of Sibley & Bearinger, of the nw ¼ of sw ¼, and the sw ¼ of the nw ¼ of sec. 26, 63-12 west, being eighty acres of the Blakestone claim, near Ely. The royalty to be paid is 30 cents a ton, and the minimum is 25,000 tons yearly.

The Winthrop property has never looked as well as now. The deposit of ore discovered in No. 2 mine a few weeks ago is holding out even better than was expected. There is a great deal of ore in sight throughout the mine, and very little "dead" work is being done this winter. There will be quite a good sized stockpile on surface by the opening of navigation, as nearly 200 men are employed underground. There are 250 men in all working at the mine. Mr. Braastad expects to do big work in his open pit next season. Considerable stripping has been done, so that there will be no delay in starting the work as soon as the ore can be shipped. The body of ore discovered last fall at No. 3 pit promises to prove very valuable. The ore is within the Bessemer limit. An assay recently made gave as a result 57.10 per cent. in iron and .054 in phosphorus. This ore will be mined on the open pit plan.—[Ishpeming Letter in Marquette Mining Journal.

An order has been placed for bailers for the unwatering of the Hamilton and Ludington mines, and it is expected they will be in shape to produce ore early in the season of navigation. When the unwatering is accomplished a pumping plant sufficient to take care of both mines will be placed in Hamilton No. 2 shaft.

In making a cut for the new Lake Superior & Ishpeming road at Negaunee, workmen came upon a body of ore extending nearly to the surface. The find is on the property of the Jackson Iron Co., and owing to its extent and the impossibility of mining the ore in case the railroad is run on the proposed line, about 2,000 feet of the roadbed, as planned, will have to be changed. The ore is 44 to 47 in iron with phosphorus low enough to be within the Bessemer limit. It is believed it can be worked on the open-pit plan.

The report that an option on the Sauntry, Mesabi Range, had been taken by the Oliver Mining Co. is denied. It is the intention of the owners, however, to do extensive exploratory work this year.

It is expected that the Cincinnati mine at Biwabik will be operated this year on a new arrangement by which the fee-owners graduate the royalty according to the price of ore.

Pumps have been stopped at the Davis, or Grand Rapids, mine at Negaunee. The property was reported to have passed into new hands in December, but ownership is disclaimed by those who negotiated for it then. The principals, it appears, have declined to accept the mine from those who arranged the deal.

Physical Tests in a Large Machinery Foundry.

The standard specification of the United States Government for cast iron entering into the construction of its machinery is that test bars one inch square, cast in sand molds, shall be capable of sustaining on a clear span of 4½ feet, a central load of 500 pounds when tested in the rough bar. Referring, in connection with this statement, to its own practice in the matter of tests, the Westinghouse Machine Co. says: "We make two mixtures in our foundry: a strong hard mixture for cylinders, pistons, rings, valves, etc., and a softer mixture for other parts which are not exposed to wear, and where, by nature of the design, the cross section of metal is far in excess of any requirements for mere strength. From every heat run off in the foundry, four standard test bars are cast; two from the cylinder mixture and two from the softer mixture. These bars are broken in a screw press so arranged that the breaking strain is registered on a platform scale. An entry of each test is made, thus giving us a complete record of the comparative strength of every individual heat taken off in our foundry since we adopted the practice several years ago. The cylinder mixture averages in strength from 25 per cent to 30 per cent above the Government requirements. For convenience in machining, we aim to keep the other mixture just hard enough to fill the specifications."

British Shipbuilding in 1895.

According to *Lloyd's Register* the construction of new ships in the United Kingdom during the past year, exclusive of war-ships, was 579 vessels, of 950,967 gross tons. Of these, 526 vessels, of 904,991 tons, were steam, and 53 vessels, of 45,976 tons, were sailing ships. It is shown that steel is used almost exclusively in the construction of steamships, no less than 98.8 per cent of the total tonnage being built of steel and 1.2 per cent of iron. The proportion of sailing tonnage has steadily declined from 24 per cent in 1892, 14 per cent in 1893, to eight per cent in 1894, and only five per cent in 1895. The war-ships launched at government and private yards in 1895 numbered 59, of 148,111 tons displacement, exceeding the war-ship tonnage of 1894 by 115,000 tons. About 20 per cent of the total output was built to the order of foreign and colonial shipowners. Of these, Norway took the largest proportion, consisting of 14 vessels, of 39,756 tons. Germany comes next, with 13 vessels, of 34,053 tons; while Russia took 29,360 tons, Spain 21,000 tons, and Denmark and Holland over 14,000 tons each. Of the principle shipbuilding districts of the country, Glasgow takes the lead, with a total output of 196,184 tons.—[London Economist.

A Good Year for the Illinois Steel Co.

A meeting of the directors of the Illinois Steel Co. was held at the offices of the company, in the Rookery, Chicago, on Tuesday of this week. A quarterly dividend of 1½ per cent was declared on the capital stock of $18,650,635. It is payable April 1, to stockholders of record March 15.

The most noteworthy information presented to the directors was the earnings of the company for the year. These were in round numbers $1,992,000, or at the rate of 10.1 per cent. At the end of 1893 the company had a deficit of $349,472. The business of 1894 was somewhat better, the net profits for the year being only $30,607. This was applied to the deficit of the previous year, reducing it to $318,865. According to the figures submitted to the directors, not only was that deficit wiped out in 1895, but in addition there was charged off $440,000 for improvements, leaving $1,233,000 applicable to the dividend. Dividends heretofore paid have been as follows: For the last eight months of 1889 (the year of consolidation), dividends at the rate of six per cent per annum; for 1893, three per cent in cash and a stock dividend of five per cent; for 1891-1892, 13.51 per cent in scrip and five per cent in cash.

Chicago's Proposed Technical Club.

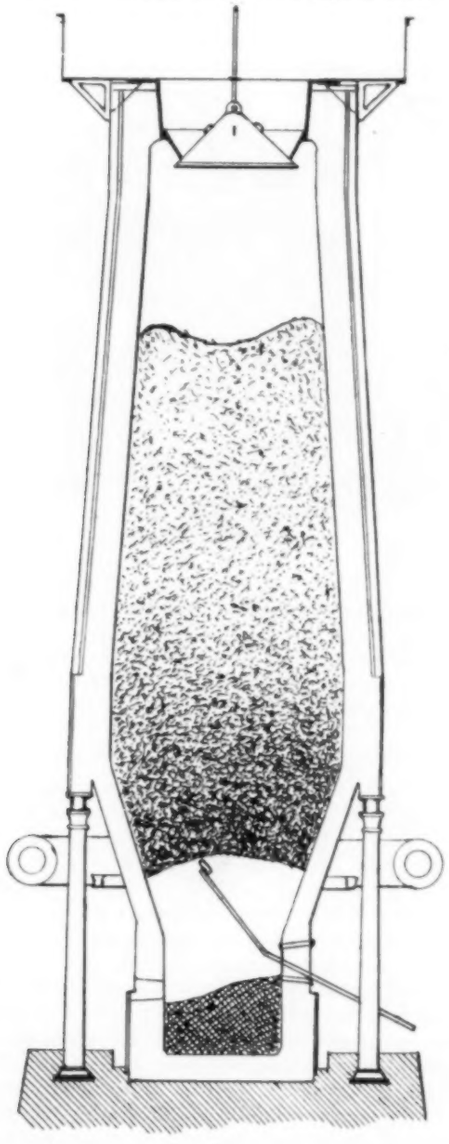
At a meeting of the members of the proposed Technical Club, held in Chicago recently, the reports of the committees on organization and quarters were received, and both committees continued in service and requested to report again at a meeting to be held at the rooms of the Western Society of Engineers, Monadnock Block, at 3 P. M. on Friday, Feb. 14. Those by-laws relating to officers and their election were adopted at the recent meeting, and acting under them the temporary chairman appointed as a committee on nominations, Thos. T. Johnston, Geo. B. Christie and T. L. Coudron. This committee has prepared and mailed its report to the members, and officers will be elected and the balance of the by-laws adopted at the meeting this week. The officers nominated by the committee on nominations are as follows: President, Robert W. Hunt, vice-presidents, W. I. Babcock and E. C. Shankland; treasurer, H. F. J. Porter; directors, Dankmar Adler, Chas. E. Billin, B. M. Gardner, Geo. H. Lederle, Alfred Noble, A. Sorge, Jr., B. J. Arnold, J. R. Chapman, E. M. Herr, Jas. F. Lewis, Isham Randolph and Jno. F. Wallace.

AT Harrisburg, Pa., a charter was granted this week to the Nagle Engine & Boiler Works, of Erie, Pa., capital $750,000.

DYNAMITE IN BLAST FURNACE PRACTICE.

BY JOHN S. KENNEDY.

Some passing references to the use of dynamite in blast furnace operations call attention again to a very interesting subject. No one more highly appreciates than the practical furnaceman, any expedient which brings speedy relief in time of trouble and shortens the time lost by stoppages. Ever since what has been called the "Witherbee method" was introduced, furnacemen have used dynamite in various ways. At first its use was confined to breaking down accumulations or scaffolds, by making an opening in the bosh and drilling into the scaffold a hole of sufficient size to admit the cartridge. In opening a chilled tap-hole, care should be taken to have the hole drilled or melted out (if the blow pipe is used) as far inside the jambs as possible and the cartridge should not be exploded until a considerable body of iron and cinder has accumulated in the hearth. A hard hole has often been closed and lost, requiring that all the vexatious labor be gone through with again, because the attempt has been made to cast before the iron was fluid enough to run freely, or sufficient metal and slag had not accumulated to insure the thorough washing out of the hole and a clear opening for stopping.



Although the insertion of an explosive into a body which may be red hot sounds impossible, there is no danger, provided the necessary precautions are used. Several times when compelled to use dynamite, I have placed it in a short piece of pipe closed at one end and of a diameter considerably smaller than the opening, to insure its being quickly placed in position. It is best to use two exploders and two fuses. The pipe should be well covered with wet clay and can be wired to an iron bar as a handle, and the fuse should be cut short if the heat of the surrounding material is sufficient to ignite it when placed in position. In removing tuyere breasts and cinder coolers, which have been ironed fast, dynamite has proved very useful, and the writer has in two cases saved time in removing lip rings which had been burned fast to the hopper by suspending a cartridge by a wire against the lip ring in such a position that its concussion was sufficient to loosen it.

A description of the successful use of explosives in breaking down a "bridge" formed in a blast furnace may be of interest. Some years since, while the writer was employed as superintendent of a furnace in the Birmingham district, the extensive coal miners' strike compelled us to bank, with very poor coke on hand. In fact, we finished filling the furnace with fine coke and screenings. The usual preparations for a long stop were made and as the brick work was very thin below the bosh jacket, this portion was thoroughly coated with clay wash. In spite of all precautions the furnace got air and the heat traveled rapidly upward. An examination made some four weeks after banking showed clinkered coke at all the tuyeres and no signs of fire below the bosh. We were stopped 11 weeks, at the end of which time the coke had settled considerably in the furnace and while there was heat in the region of the mantel, the crucible and lower bosh walls were cold. On opening the furnace, we found the crucible full of clinkered coke and ashes, which we removed through the tuyere openings and cinder notch, until we had cleaned out the crucible from the level of the bottom of the cinder arch to some two or three feet above the tuyere centers, at which point a "bridge" of hard clinkered coke could be seen extending across the furnace. To break down this "bridge" in the hope of getting bright coke at the tuyeres was the first consideration and to this end I had the carpenter make several pieces of light scantling nailed together so as to reach to the center of the furnace. The accompanying sketch shows the position of the "bridge" in the furnace and the method of introducing the explosive. Dynamite of 50% strength was used, the first cartridge fired shaking down a small amount of black coke clinkers. A second cartridge produced a like effect and on the third trial I used two cartridges, which successfully broke down the obstruction and filled the crucible with material which contained considerable red hot coke. Blast was put on as quickly as possible, the furnace starting nicely, making plenty of gas and the tuyeres soon showing bright. Three hours after starting we opened the cinder notch and filled all the available room in the cinder yard with a flush of coke cinder which ran well. A small blank charge of coke was followed by a light burden of ore and scrap until the furnace resumed normal working.

There is a point here to which I wish to call attention and I have heard other furnacemen speak of it, and that is, the comparatively long time it requires for a furnace which has been banked to come to a good foundry iron. This is undoubtedly due to clinkered material remaining in the hearth and on the bosh walls, which, while not sufficient to offer resistance to the regular descent of the stock, restricts the area of the bosh and absorbs heat while being removed.

The poor quality of the coke used in banking, averaging over 18% ash, and the impossibility of keeping the furnace air tight, account for the clinkered condition of the stock after the comparatively short stop of 11 weeks.

Personal.

Charles Pettigrew, manager of the Joliet mills of the Illinois Steel Co., resigned his position last week Wednesday. Mr. Pettigrew has been connected with the Illinois Steel Co. for over 25 years, starting as a machinist and working his way to manager. For the present he will remain in Joliet, but expects soon to take a trip abroad. W. C. Catlin, who has heretofore been superintendent of the Joliet works, will assume entire control, the office of manager being abolished.

Henry Wehrum, who was chief engineer of the Scranton Steel Co., and was appointed chief engineer and general superintendent of the Lackawanna Iron & Steel Co at the consolidation, has been made general manager, succeeding C. W. McKinney, who resigned on account of ill health.

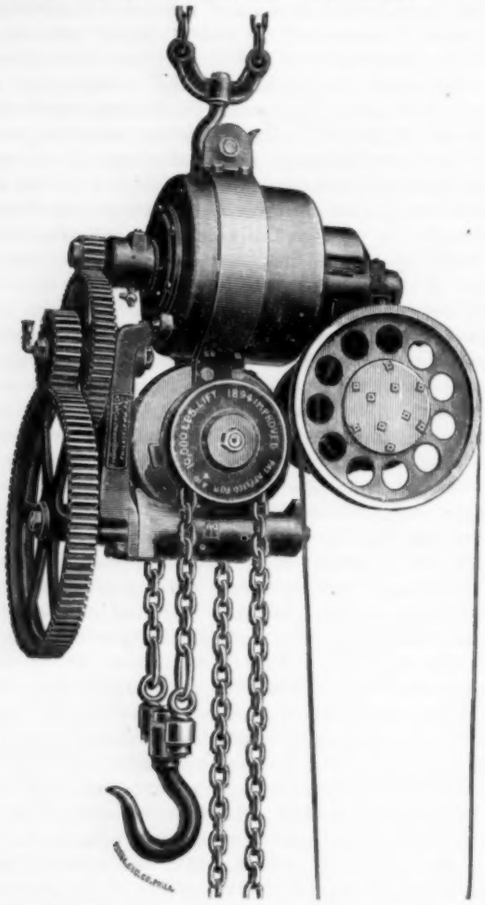
James McNaughton, of Iron Mountain, Mich., superintendent of the Chapin mine, and manager of several mining properties on the Gogebic and Mesabi ranges, is mentioned by a number of upper peninsula papers as likely to be made a district delegate to the Republican National convention.

HARRINGTON HOIST WITH ELECTRIC MOTOR.

The application of electricity tc the portable hoist is a noteworthy development in connecting with such appliances. The electric crane has a large and widening field of usefulness; but the crane has only a limited area under its control. An electric portable hoist makes it possible to apply electricity in many places where the crane cannot be used.

It is claimed that the new combination, in which the hoist is of the Harrington type, gives a saving of two-thirds the labor required to lift 6,000 or 8,000 lbs. by the hand power hoist. Ten thousand pounds can be lifted with ease, and a saving of three-quarters the labor, while the gain in time is given at five to one; that is, 10,000 lbs. can be raised at a maximum speed of 5½ feet and lowered at the rate of 10 feet per minute. Smaller loads can be raised faster.

By means of a controller operated by the rope shown on the right of the cut, the operator can vary the speed as he may



desire, within these limits. This controller also starts, reverses or stops the motor.

The motor shown in the cut is of the Storey design. It is multipolar, iron clad and not affected by surrounding machinery. It is entirely inclosed. The makers are Edwin Harrington, Son & Co., of Philadelphia.

MANY who saw and admired the wonderful electric lighting machines furnished by the Westinghouse Electric & Mfg. Co. to the Columbian Exposition Co. for the purpose of illuminating the World's Fair, were led to ask what would be done with these machines when the Fair was over. It will be interesting to know that the Westinghouse Co. recently furnished four of them to the United Electric Light & Power Co. of New York, and they are furnishing current for lighting a considerable portion of the metropolis. Several others are installed in the plant of the Brush Electric Light Co., at Baltimore, while the rest are distributed in several large electric light plants throughout the country.

THE Missouri Gas Co., of Kansas City, Mo., through the National Gas & Water Co., of Chicago, has just placed an order with Willis Shaw, 416 New York Life Building, Chicago, for an equipment of McNeil patent balanced charging barrows, for its works at Kansas City.

CENTRIFUGAL OIL SEPARATOR.

The centrifugal machine for separating oil from chips or small pieces of work made on the screw machine is a valuable device that is not long in saving its cost. With the type here illustrated it is unnecessary to remove the cover from the vessel, and the machine is automatically emptied of the chips or work after the oil has been separated.

In operating the machine it is necessary only to throw the material from which the oil is to be separated into the open top of the machine and set it in motion. It runs at 1800 revolutions per minute, and the centrifugal force throws the oil over the edge of the basin and into the circular trough shown inside the casing, whence it flows into the pail placed to receive it. When the oil ceases to flow, a simple movement allows the lower portion of the basin to slide down upon the shaft to the position indicated by the dotted lines, and upon again starting the machine the material is thrown out upon the inclined

plate shown, and is delivered outside the machine. The amount of handling of material is thus very much reduced, and the efficiency of the machine considerably increased. The machine is self-balancing, runs with little power. It is 34 inches high, 26 inches in diameter. The Davis & Egan Machine Tool Co., Cincinnati, is the maker.

The Nugget Method of Using Fine Ores.

The Acme Mineral Nugget Co. was incorporated in Camden, N. J., Feb. 5. The directors are: M. Nirdlinger, Milwaukee, president; S. F. Nixon, Philadelphia, vice president; H. S. Mould, Cleveland; R. W. Lesley, Philadelphia; J. F. Joline, Camden, N. J., secretary; and F. Nirdlinger, Philadelphia, treasurer. The Illinois Steel Co. closed a contract with the company for 1000 tons of nuggets, to be made of flue dust, from the steel company's furnaces at Chicago. The Acme Co. began work on this contract at its Chicago plant, Monday, Feb. 10.

Experts connected with many of the leading steel companies and other companies smelting ores, have given this new industry careful investigation, and have passed a favorable judgment on the process and its results. An economical method is offered by the company of utilizing the waste flue dust from blast furnaces, and all fine ores, including manganese.

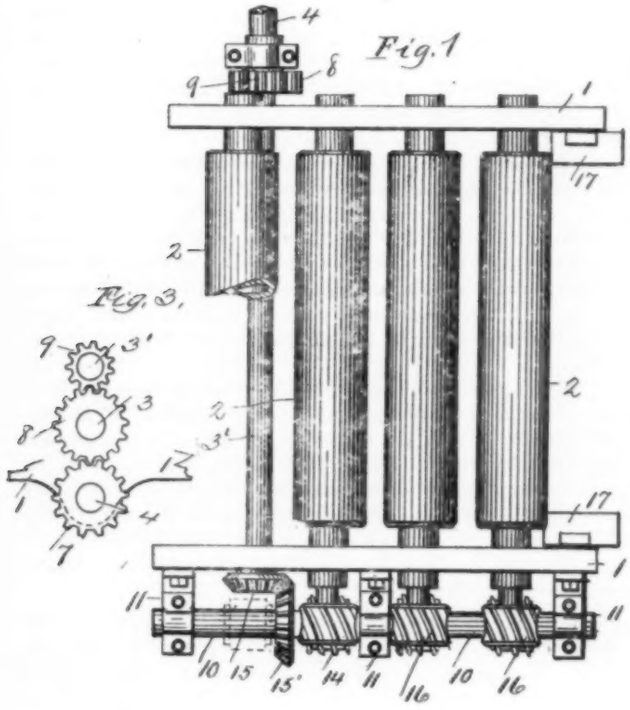
The machinery used is simple, very strong, and it is claimed, not expensive to operate. Six men can turn out 300 tons of finished ore nuggets in ten hours. But five minutes elapse from the time the ore enters the building until ore nuggets are ready for the furnace.

Negotiations are now pending for the erection of several plants in Illinois, Ohio, Pennsylvania, and the Northwest, The offices of the Acme Mineral Nugget Co. are: South Broad Street Theatre Building, Philadelphia; 19 Wade Building, Cleveland; and 360 Farwell ave., Milwaukee.

THE Davis & Egan Machine Tool Co., of Cincinnati, (formerly the Lodge & Davis Machine Tool Co) held its first annual director's meeting Feb. 3. Chas. Davis was elected president, W. H Burtner, vice-president and treasurer, and B B. Quillen, secretary. A dividend of six per cent was declared on the capital stock for the past six months. The new company starts with good prospects.

ROLLING MILL REVERSING TABLES.

An improvement on the method in general use for operating rolling mill reversing tables has been devised by Samuel E. Forbes, of Pittsburg. Its features are indicated by the accompanying illustrations. In three-high mills, the table for receiving the metal from the lower pass and elevating one end for the upper pass, ordinarily consists of a series of parallel rolls arranged in a frame, with means for rotating them and for reversing the rotary movement. This has been accomplished heretofore by means of a line of gear-wheels and idlers connecting the one roller with the other. It has been found



by the use of these gear-wheels that the teeth are broken, stripped and otherwise damaged when the movement of the rollers is abruptly reversed, which is of frequent occurrence while the mill is in use. To obviate this jarring and damaging effect on the table is the object of the improvement.

Fig. 1 of the drawings shown is a plan view of an ordinary rolling mill table provided with improved means for operating the rollers, constructed and arranged in accordance with Mr Forbes' invention. Fig. 2 is a side elevation, partly in section

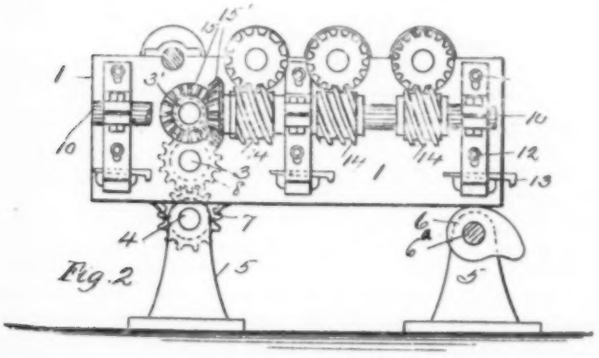


Fig. 3 is a rear elevation showing the chain of gearing connecting the power with the shaft for driving the rollers.

The frame 1 is provided with a series of rollers 2, arranged in bearings side by side and adapted to receive the metal from the rolls. This table is pivoted at the rear by means of a shaft 4 and suitable standards 5 so that the front end of the table may be elevated by the cam-lever 6 arranged on a shaft 6a, whereby power is applied. The drive-shaft is provided at one end with a gear-wheel 7, which is in mesh with a gear-wheel 8, and it in turn has connection with a gear wheel 9, which is of small diameter to obtain an increased speed. The pinion 9 is mounted on one end of a shaft 3', which extends transversely across the table and is fitted with a bevel-pinion 15, in mesh with another, 15' mounted on a shaft 10, arranged in the direction of the length of the table. This shaft is mounted in adjustable bearings 11, which may be moved vertically a short distance to take up the wear of a number of worms 14, attached to the shaft. This adjustment is also necessary when removing or replacing the worms and worm-wheels upon the shaft. These bearings are adjusted by bolts passing through slotted openings and held at the desired position by gibs and keys at the base. This shaft is fitted with a series of worms 14 of very steep pitch, preferably having five distinct threads, which will give a quick rotary movement to the worm-wheels 16, in which they mesh and the worm-wheels attached to the spindles of the rollers 2 will give them the required speed. The worms, besides giving an increased speed by means of compounded threads, give a greater number of teeth in mesh at one time. Thus, no matter when reversed, they are always in readiness, without any abrupt jolting or jarring, to come into position. Suitable guides 17 are arranged at the receiving end of the table to keep it in line.

By thus operating the rollers, any jar or knocking of the parts is obviated, as the worms and worm-wheels will give a steady movement in either direction to the rollers, thereby reducing the cost of operating the tables. The shaft carrying the worms may be adjusted vertically and the wear on the parts may be taken up.

The Carnegie Steel Co., Ltd., has one of the new tables on each side of its 72" plate mill. These tables have been in operation for upward of four months and have given good results. While a large tonnage has been turned out, repairs have been practically nothing. Thos. Higgins, 4918 Sciota st., Pittsburg, will answer any inquiries for further details concerning the mechanism.

A Well-Equipped Southern Foundry.

The foundry building erected some time ago by the Berlin Iron Bridge Co., of East Berlin, Conn., for the Newport News Foundry Co., of Newport News, Va., contains one of the most complete equipments to be found in the South. We are indebted to the foundry company for the following data:

The main building is 200x85 feet, and operations are controlled by two traveling cranes, one 25-ton and one 10-ton, built in Philadelphia. The cranes leave 24 feet under the hooks and travel the full length of the shop. There are three cupolas: One 48" inside, capacity 10 tons per hour; one 38" inside, capacity about seven tons per hour, and the third a small one. The casting shed is at the south end of the shop, at which a Chesapeake & Ohio R. R. siding enters. Blast is furnished by three Baker blowers, one blower for each furnace, which permits of running one furnace at a time or all three at once. The brass shop is 50x60 feet, separate from the iron foundry It has 12 sets of furnaces, traveling and jib cranes, and band saw for brass.

At the north end of the iron foundry, outside, is a traveling crane which is used to carry flasks in and out of the shop. Its capacity is 10 tons and it travels 200 feet. A large jib crane commands the core room. The crane equipment consists in all of four traveling and two jib cranes. A separate building, 50x100 feet, is devoted to the storage of patterns.

The output of the foundry consists of green sand, dry sand and loam work, which is all done for the Newport News Ship-Building & Dry Dock Co. The foundry is now working on parts of nine ships, which are under contract by the ship-building company and is just starting on two first class battleships for the Government, the Kearsage and Kentucky. It is the expectation that the brass shop will be enlarged in the near future.

THE Petersburg Fire Brick & Tile Co., of Coal Grove, O., has just received an order from Jas. P. Witherow, of Pittsburg, for all the fire brick and clay for the three large fire brick Whitwell stoves, for the remodeling of the Etna furnace at Ironton, O. The stoves are three in number and are 22'x70'. It will require 750,000 fire brick for the contract.

THE American Foundry & Furnace Co. has been incorporated at Bloomington, Ill., with a capital stock of $120,000, to manufacture foundry supplies, by Clinton P. Saper, Thomas C. Kerrick and Henry D. Spencer.

MOLDING SAND AND ITS PREPARATION.*

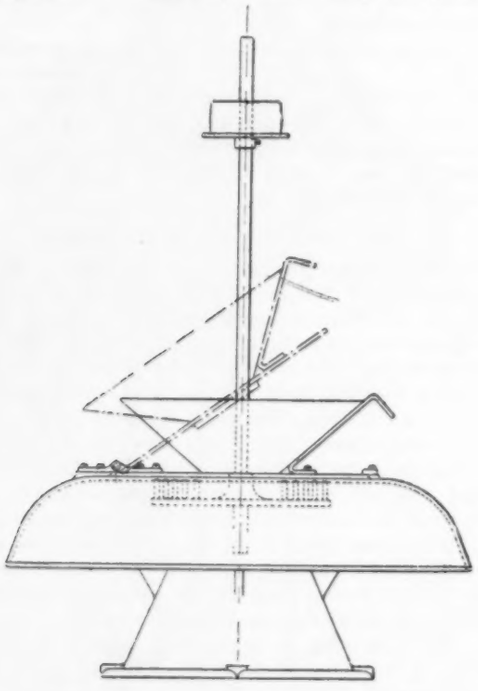
BY ALEX E. OUTERBRIDGE, JR.

The essential qualities of good molding sand are toughness and porosity. Toughness is the quality which enables individual grains of damp sand to adhere together when pressed in the palm of the hand, and larger masses to retain the impress of a pattern when the sand in the mold is rammed by hand or by machine power. Porosity is the quality which permits free escape from the mold of heated air, steam, and gases, formed at the moment of pouring a casting.

These two qualities are dissimilar, and may almost be described as antagonistic, since the presence of alumina, clay, or "loam," in excess, which imparts toughness, tends to close the pores or spaces between the sharp grains of sand, and thus to prevent the free escape of gases, while on the other hand, porous molding sand, if deficient in alumina, is weak.

The most highly prized molding sands are those in which toughness and porosity are united by nature uniformly and properly for the molder's purposes. It is rare to find the clay "binder" and the grains of sand distributed uniformly so as to make a homogeneous material, or, to speak more explicitly, to find each individual grain suitably provided with its little overcoat of alumina or clay.

One portion of a sand bank, for example, may have too



CENTRIFUGAL SAND-MIXING MACHINE.

much loam, owing to various local causes (such as contiguity to grass roots or other vegetation, the depositing of too much clay by infiltration and settlement from muddy water, etc.) in which case the sand is technically described as "too fat." Another portion of the same bank may be composed too largely of "sharp sand," in which case it is "too lean."

A mold made from such heterogeneous sand is apt to be spongy in some parts and hard in others, conditions which are liable to cause various defects in the mold and casting, such as a "break-down," due to lack of binder in the sand, a "scab" or "blow" due, on the other hand, to the hard spots caused by an excess of loam. The molder does not always correctly reason out these causes of defects, but he knows by experience that all molding sand is improved by riddling, treading, or reworking, and not a few very careful molders consider this work an important part, if not actually a secret of their trade. This "secret," of course, is in producing a more homogeneous molding material by these crude methods.

In view of the advance that has been made in scientific foundry practice in recent years, it is somewhat surprising that so little is known, or at least published, regarding the character and treatment of molding sand. Mr. Walter Bagshaw, of Batley, England, read an interesting paper upon the subject a few years ago, before the Institution of Mechanical Engineers. More recently the *Foundry* had a very brief article, and the molders' text books contain the usual empirical rules for preparing molding sand. Beyond these references, I do not know of any exposition of this not unimportant branch of the founder's art, either from a technical or an elementary standpoint, and I am under the impression that comparatively few founders have investigated the subject further than to become sufficiently expert to squeeze a ball of damp sand in the palm of the hand, and thus judge of its strength. The so-called expert then usually trusts to luck, and if that fails, as it sometimes does, he probably startles the unfortunate sand man by an unexpected complaint. These amenities are perhaps regarded by the founder and the sand man as normal incidents of the business. Be this as it may, I am convinced that the average founder is blissfully ignorant of the composite character of his molding sand, and also of the financial importance of the question; furthermore, he would be surprised to find what a simple study the problem really is.

A microscope of moderate power, magnifying two or three hundred diameters, will greatly enlarge his knowledge, and a little washing pan, preferably having ledges or pockets, similar to those used by "gold panners," will enable any foundryman, after a little practice, to determine in a few moments (approximately at least) the character and value to the molder of any sand. By the aid of a students balance, a much more accurate analysis may be made without expert chemical knowledge.

The average 'good molding sand" contains from five to 10 per cent of alumina or clay. This is the "binder." The proportion of clay may be roughly ascertained by weighing a dried sample of sand, washing the clay out of it, again drying and re-weighing. Floating particles of organic matter may be collected and the weight deducted, but an accurate determination of the organic matter requires prolonged combustion in a platinum crucible, an operation which presupposes the employment of a chemist.

From 80 to 90 per cent of ordinary molding sand is silica (silicon-oxide) and simple washing, while giving a rotary motion to the pan, will serve to collect different sized particles of the silex or sand in the different pockets or ledges, a large preponderance of very fine particles of silica is almost as deleterious (if the sand is to be used in large molds) as an excess of alumina, impairing the porosity of the mold.

In addition to silica and alumina, molding sand often contains a little iron, some magnesia and lime, but these elements are usually not important. The presence of iron is indicated by the color of the sand, and if a sample containing iron is heated red hot, and then cooled in the air, it becomes quite red in color from oxidation of the finely divided iron.

By examining in the simple way I have stated, several samples of sand from a boat or car load, any marked differences in composition, size of grains, or uniformity of distribution of the binder may be readily detected.

It is more difficult to thoroughly mix different grades of sand, or other substances with sand, than it is to ascertain the composition. Synthesis is in this case more different than analysis.

The foreman who prepares a batch of "core sand," for example, by adding certain measures of flour, coal-dust or other materials to a given number of barrow loads of sand, knows that it is necessary to turn over the pile many times, and also to pass the materials through sieves to obtain even an approach to a homogeneous mixture. If the sand is too damp, some of these substances adhere together and clog the sieve; if it is too dry, some of the impalpable particles fly off into the air. It is thus apparent that the proper preparation of molding and core sand requires time, labor, and at least some degree of skill.

Different foundries have different rules for making "core sand," or "facing sand," and for enriching the "heap sand," depending a good deal upon circumstances.

The German rule for facing sand is to add one part by measure of new sand to two parts of old sand, to which is added bituminous coal dust in proportion of 1-10 for large castings to 1-20 for small castings. In England four parts by weight of new sand and one part of coal dust are commonly added, to six parts of old sand for ordinary work.

In this country similar rules obtain, with variations, de-

* Read at the meeting of the Foundrymen's Association at Philadelphia, Feb. 5, 1896.

pending upon the kind of sand and character of work. Where the mold requires overhanging parts, the sand must be strong, but in simple box shapes more "rotten" sand is better. The good judgment of the foreman is here exhibited.

Plumbago is chiefly confined to "printing," or surface dressing with a sleeking tool. Whatever special proportions are used in different foundries, the same necessity exists in all for thoroughly mixing the old and new materials, and, until comparatively recently, the old methods of riddling and spading were adhered to. In Germany, a Mr. Schultze proposed a new method, which though imperfectly carried out by him, was decidedly revolutionary, and a few years ago the firm of Wm. Sellers & Co., Inc., Philadelphia, began experimenting upon this new principle of preparing molding and core sand by the aid of centrifugal force. The first machine was a comparatively crude affair, but when the correctness of the principle was demonstrated, the apparatus was remodeled and greatly improved. This now thoroughly practical and simple machine (resembling a giant toad-stool) attracted the attention of visitors at various times, and duplicates were made at the solicitation of the representatives of several of the largest establishments in Philadelphia.

These little machines then created for themselves a reputation which was followed by a demand for more of them, and the apparatus is now regularly manufactured by the Sellers Co. for sale.

The machine is remarkable both as a labor saver and as an improver of molding sand. It accomplishes as much work by the help of two laborers working three hours a day in preparing facing sand, as five men could do in 10 hours by the old method, and it is found that as the sand is much more uniformly mixed and tempered, its quality of toughness (without impairment of porosity) is decidedly improved. The expert can readily perceive the difference by making a ball of sand before and another after passing once through the machine.

The apparatus consists essentially of a rapidly revolving table having upon its upper surface a number of prongs grouped about a central axis. The sand is fed through a hopper and thrown with great force from prong to prong, emerging from beneath the cover in a fine shower, free from lumps and thoroughly mixed.

The hopper is hinged for convenience of cleaning the revolving plate and prongs, and for removing stones, nails, etc.

A vertical shaft carries the revolving plate and a pulley for the driving belt. The apparatus is also furnished, when desired, with a small electric motor, and may be shifted to any part of the foundry that is convenient for its ope ation.

A box containing "strong Lumberton" molding sand in the form of hard lumps ranging in size from an English walnut to an acorn was shown by Mr. Outerbridge, together with another box containing a sample of the same batch of sand after being passed once through the machine. This was entirely free from lumps, and looked as uniform as though it had been carefully screened. The machine, it was stated, is not intended to separate jaggers, nails or large stones. Sand containing such foreign bodies should be passed through a coarse screen before going to the centrifugal mixer. In addition to this exhibit, specimens from the laboratory were shown (mounted under mica plates) of mo'ding sand and its constituents, also of facing and core sand, and the speaker said that it was his intention at some future time to take up the subject still more in detail.

"NEWPORT NEWS has gone into the ship-building industry on a bigger scale than it has ever before attempted," said ex-Congressman Libbey, of Virginia, in Washington recently. "Besides the three gunboats and the two battle-ships to be built for the Government there is a goodly number of merchant vessels now in course of construction and others under contract. The building of the battle-ships marks an era in the history of the town. That they can be turned out there satisfactorily to all parties concerned I haven't the slightest doubt. No better equipped ship yards, with finer machinery and higher skilled workmen, are to be found in this country. The plant is as complete and modern as any in the world. The city of Newport News will reap a golden advantage from the establishment of this great industry."

COKE FOR THE FOUNDRY.—I

Its Characteristics, Methods of Manufacture and a Founder's Experience with It.

BY THOS. D. WEST.

The primitive methods of coke manufacture were by burning coal in mounds or open piles. It is claimed that oven coke was first made by two carpenters, Province McCormick and James Campbell, in company with John Taylor, a stone mason, on a farm by the Youghiogheny river, in Pennsylvania, in 1841. In introducing this coke or "cinder," as it was called by the pioneers, they met with many reverses and coking coal seemed doomed to failure. It is said that Campbell took his first coke down the Ohio river to Cincinnati in two boats containing about 800 bushels and remained in that city for nearly two months, retailing one boat load at eight cents a bushel to foundrymen and trying to educate them to its use. The second boat load was traded to Miles Greenwood, a foundryman of Cincinnati, for a patent grist mill, which Campbell took back with him to Connellsville, Pa., where it proved a failure. A part of the boat load Greenwood shipped by canal to Dayton, O., where Judge Gebhard, an old foundryman, purchased the coke and found on experiment that it possessed the commendable qualities now so well known the world over. The judge hunted up Campbell and his associate and tried to induce them to make more, but the financial outcome of their first attempt had so disheartened them they could not be induced to invest any more in the enterprise. However, Mr. Greenwood was not to be repulsed by this action. He kept the matter so agitated that the ovens on the Youghiogheny were rented to Mordecai, James and Sample Cochran, who then commenced the manufacture of 24-hour coke. Mr. Greenwood had the first coke the Cochrans made boated to him at Cincinnati.

Mr. James B. Laux, to whom I am chiefly indebted for the above facts as to the early manufacture of coke, says in the Pittsburg *Dispatch*, July 28, 1895. "From this time on until 1885 but few ovens were built, not over 26 being operated above Pittsburg. It was a period of experiment, failures, nursing and education. The completion of the Baltimore & Ohio Railroad to Pittsburg and the use of the Connsllsville coke in the Clinton Furnace at Pittsburg in 1860 marked a new era in the manufacture and use of coke, for then was demonstrated its great value as a furnace fuel and the foundation was laid for its present unrivaled position in the fuel world."

About 12 years ago anthracite coal was the fuel chiefly used for melting cast-iron in foundry work. Pennsylvania and Ohio took the lead in the general adoption of coke, and its use has increased to such a degree that few places in the country are now found using coal wholly as a fuel for melting. Coke has forced its adoption main'y from being a cheaper fuel, requiring less blast and melting more quickly than coal, but the latter has also still some advantages.

Owing to the fact that chemical and physical properties of the fuel have much to do with the character of cast-iron when made or remelted, the writer has thought a general article on this subject would be of interest to foundrymen. The process of making furnace and foundry coke simply consists in taking soft or bituminous coal, which generally resembles the slack used for firing boilers to raise steam, and letting it burn in a smoldering fire for 48 to 72 hours in what are called coke ovens, generally of the form seen in the accompanying cut. More detailed reference to the illustration will be made in the next article. Other methods and forms than that shown in the illustration are used, and some of them are covered by patents, the advantages claimed for them are in the recovery of by-products, in obtaining high carbon in the coke, eliminating sulphur and other impurities in the form of phosphorus, hydrogen, oxygen, and nitrogen, also in saving labor and obtaining a large yield of coke from the coal. As yet, the class of ovens known as retort ovens, has not been introduced to any great extent in America. France and Germany have done much to perfect the coking of coal. It is said that progress in this line is chiefly due to them and that they have the best methods in coking. To have personal knowledge of the process of coke-making, the writer paid a visit to the ovens to observe the act-

ual workings of those of the bee-hive type and was well paid for the time spent in the trip, as it afforded a clearer idea of operations than anything he had read. He trusts his observation and study will enable him to make the subject clear to his readers.

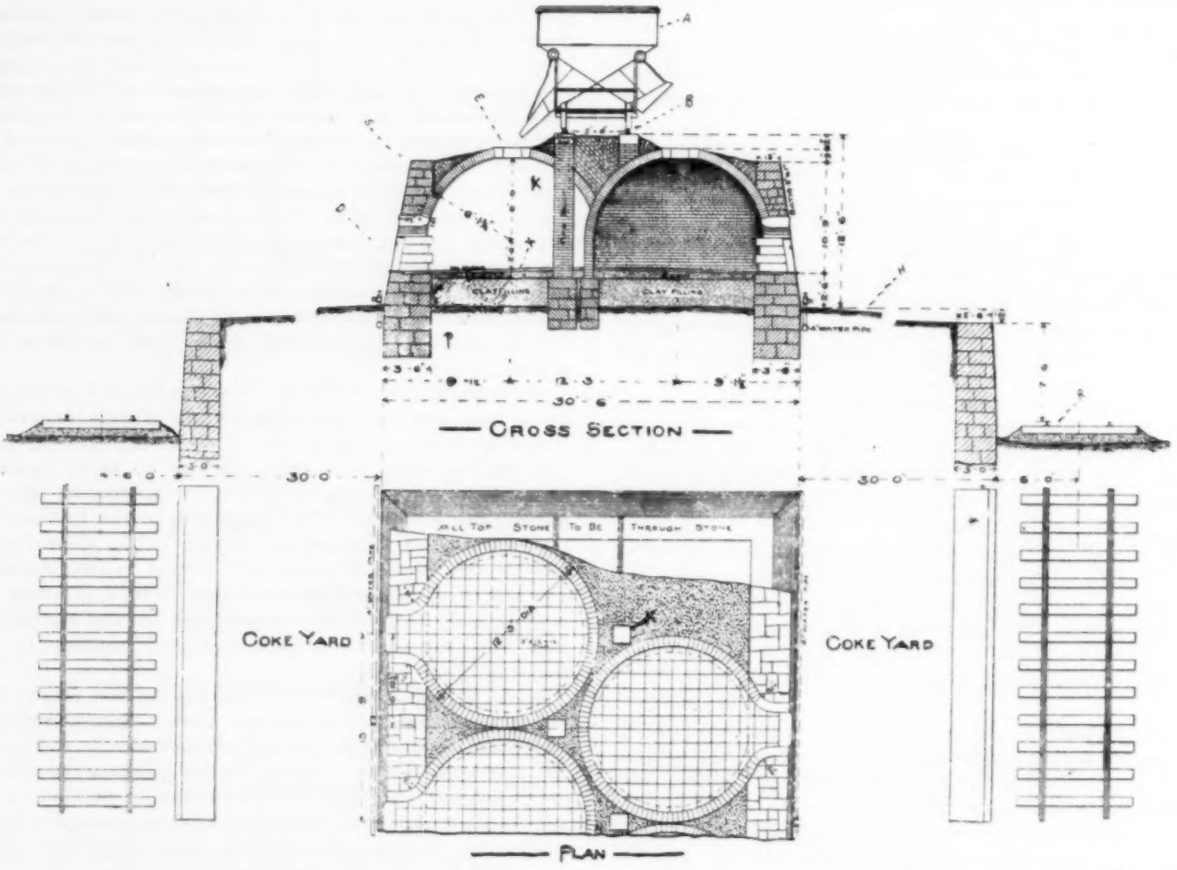
Coke has its chemical and physical qualities, as iron has, and conditions in coking coal cause a great diversity in chemical composition. The chemical qualities desirable in coke are: first, that it be low in sulphur; second, that it be high in carbon, and third that it be low in ash.

Sulphur in Coke.

The evil of having high sulphur in coke often leads to very serious results in founding as well as in furnace work, owing to the great affinity which iron has for sulphur. For all work such as chill rolls, car wheels, ingot molds, light machinery and stove plate, with the iron generally used, the sulphur should not exceed more than .80. For such work as heavy gearing, housing, punches, etc., sulphur may often be permitted to approach 1.00 in coke but it is better kept down to the .80 notch, if possible. Where high sulphur coke is used, it should be done with intelligence and full knowledge of its effects and how high it may be permitted to run, with the chemical properties in the iron, and not seriously injure the castings produced.

It is very essential in coking coal that plenty of pure water be had. A drought can make water so scarce, that what little runs over the hills, or comes from wells, will absorb sulphur from the ground and carry it to the coke. An experience of this character in the year 1894 affected most of the furnaces and foundries using Connellsville coke, and the writer's foundry suffered losses from this cause. As a general thing, the coal from which coke is made contains more sulphur than the coke. If the coking is conducted properly, the product from bee-hive ovens generally contains about one-half as much sulphur as the coal did from which it was made. But this is claimed to be improved upon by patent ovens largely used in Germany and France. The process of coking has much to do with the percentage of sulphur in the product. Coke from the same coal and oven can and often does vary greatly in percentages of sulphur. There are many conditions affecting this. High temperatures and rapid driving rather tend to an increase of sulphur in coking. This differs from the results obtained by high temperature in a furnace or cupola, as in the latter the effect is to lower the percentage of sulphur which the iron may absorb from the coke. But to insure this action, lime or some good flux is often necessary. Manganese is also good for lowering sulphur. This leads the writer to remark at this point, that the difference in results which two founders may often find from practically the same coke may be due to the chemical properties of the iron used. An iron high in manganese, phosphorus or silicon will be less affected by the sulphur in the coke than when these properties are low. Coke high in sulphur may injure one founder and not another. This should lead all intelligent founders to a study of the properties existing in the iron as well as in the fuel, in endeavoring to account for results, in their relation to sulphur in the coke.

To test the sulphur contained in coke a chemical analysis is often advisable. If sulphur is above .90, it can often be told by the odor of the escaping gases and the stifling fumes a cupola will emit, as compared with coke below .80. A bright silvery lustre may indicate that the coke is low in sulphur. Often coke can be found having a sulphur color, which, of course, indicates it to be a high sulphur coke. Low sulphur coke has never done a founder harm, but high sulphur coke has. It will stand the founder in good stead to watch this matter, if possible, to always have some knowledge of the amount of sulphur which his fuel or coke contains.



THE Columbia Spring Co., with its principal office in Pittsburg, has assigned to John M. Kennedy, of Covington, Ky. The company had plants in Bridgeport, Conn.; Canton, O.; Cincinnati; Fort Plains, N. Y.; Newport, Ky., and at points in Mississippi, Missouri, and Iowa. Assignments were filed in all of these States. The assets are stated to be $271,702, and the liabilities $208,824, consisting of debts due of $172,497.22, and debts about to become due of $36,336.99 Wm. G. Park, of Park Bros. & Co., steel manufacturers of Pittsburg, was president; John C. Rodgers, secretary, and George Wright, Jr., of Park Bros. & Co., treasurer. Park Bros. & Co. are the principal creditors and their claims are said to have been satisfied. It is stated by an officer of the company that it had not enough working capital for the number of plants it operated, and that some of the plants would be sold and the company would do business under the assignee. Reuben Miller, a preferred creditor, took cognovit judgment against the company in Cleveland court just before the assignment.

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INDUSTRIAL SUMMARY.

New Buyers in the Market, and Some of Their Wants:—

[If you are in need of machinery of any description, please notify *The Iron Trade Review* and we will put you in communication with our advertisers at once.]

John Crowley and Robert Pettigrew have started a new foundry and machine shop at McLean, N. Y.

C. L. Holman, Sandy Hill, N. Y., wants to correspond with manufacturers of galvanized hoop iron and rivets.

The Puget Sound Iron & Steel Works, Tacoma, Wash., has been incorporated, with a capital of $30,000, by John L. Roberts and A. C. Marconlier.

W. A. Jones Foundry and Machine Co., 57 S. Jefferson st., Chicago, is in the market for a second-hand engine lathe, 18 to 20 inch swing, and a portable forge and anvil.

The Smith Sons Gin & Machine Co., Birmingham, Ala., wants a boring and turning mill to take in 13 feet in diameter; second-hand machine in good condition will do.

The American Weldless Tube Co., has been organized at Toledo, O. The directors will be Edward Marwick, general manager; S. Snell and R. N. Ransom. The mill is to have a capacity of 200,000 feet of tubing per month.

Lorain, O., is to have a new foundry. The corporation will be known as the Lorain Foundry Co., capital $40,000. Among the stockholders are President A. J. Moxham and Manager Max Suppes, of the Johnson Co., J. B. Hoge, E. M. Pierce, John Stang, of Lorain, and A. L. Garford, of Elyria. The foundry is to be located near the Johnson Co.'s steel plant, and the Johnson Co. will probably be its chief customer. Operations are expected to begin at an early date.

Additions, Enlargements, Removals, Etc.:—

The Sebastian Lathe Co., Cincinnati, will erect a new brick building 75x90 feet especially adapted for the production of lathes at Covington, Ky. It is expected that the premises will be ready for occupancy March 1, 1896.

The Crown Point Mfg. Co., Crown Point, Ind., will enlarge its foundry considerably. An electric light plant is also to be installed.

Negotiations are under way for the removal of the George B. Sennett Foundry & Machine Works from Meadville, Pa., to Youngstown, O. A site has been practically agreed upon, but some questions as to railroad facilities are unsettled.

The National Tube Works Co., McKeesport, Pa., will add two new furnaces to its welding department. Other improvements and additions to equipment are under consideration and if carried through will considerably increase the output.

The New Castle Tube Co., New Castle, Pa., is erecting a new rolling mill building to contain two heating furnaces and two sets of rolls. The Shiffler Bridge Co., of Pittsburg, has the contract for the building, while the A. Garrison Foundry Co., of Pittsburg, will build the roll trains, housings, etc. Mackintosh, Hemphill & Co., also of Pittsburg, will furnish the steel pinions, and the spindles, couplings, etc., will be furnished by the Otis Steel Co., Ltd., Cleveland. The New Castle Tube Co. will also commence the erection in a short time of a warehouse 110 feet square, built entirely of brick and steel.

New Construction:—

W. K. Henderson is erecting a foundry and machine shop, to cost $30,000, at Shreveport, La.

The Indianapolis (Ind.) Steel Roofing Works will erect a two-story brick building 200 x 50 feet.

The Brewer Seamless Tube Co., Toledo, O., has its new plant nearly ready for occupancy. The capacity at starting will be 100,000 feet a week.

The new steel plant of the Elmira Iron Mills, at Elmira, N. Y., is progressing rapidly and the furnaces are to be of the latest design. It is understood that the Elmira Bridge Co., and the Athens, (N. Y.) Bridge Co., will use a large part of the

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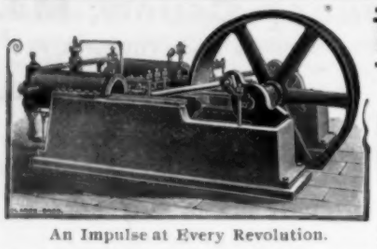

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output. The new steel mill is expected to be in operation by March 1.

The Ludlow-Saylor Wire Co., St. Louis, has just closed a contract for a new building which will be ready Oct. 1. Rapid increase in business called for more room.

Ground will be broken this week for the new plant of the American Weldless Tubing Co., at Toledo, O. It will be 215x115 feet and at the start 300 men will be employed.

Wm. B. Scaife & Sons, Pittsburg, will soon begin the erection of the buildings for the Connellsville (Pa.) Sheet & Tin Plate Co. The plant will consist of four large buildings.

The Pioneer Rail Renewing Co., which leased the North Chicago rolling mill of the Illinois Steel Co., will probably build a plant of its own at Joliet, the lease on the present plant having expired.

The Berlin Iron Bridge Co., of East Berlin, Conn., has just completed for the Silver Springs Dyeing & Bleaching Co., of Providence, R. I., three buildings made with steel frames and corrugated steel coverings, an engine house, a box shop and a boiler room. The Berlin Co. has also lately completed a fire proof boiler room for the Passaic Print Works, at Passaic, N. J.

The new foundry of the Enterprise Foundry Co., of Muskegon, Mich., will consist of a main building, 50x100 feet; large core room with core oven 10x10x30 feet; cupola room with a 54 inch cupola; also chipping room, shipping room, pattern storage room and office. All the buildings are of brick with corrugated iron roof.

Fires and Accidents:—

At Wheeling, W. Va., the machine shops of C. M. Hart & Co., burned; loss $30,000.

An explosion at Jones & Laughlins' works, Pittsburg, Feb. 10, due to the ignition of gas from a leaking valve, fatally burned one workman and seriously injured three others.

The iron working plant of H. Humphrey & Sons, Joliet, Ill., was damaged by fire to the extent of $70,000 Jan. 26, fully insured. The principal loss was of patterns, the foundry and machine shop being only slightly damaged.

General Industrial Notes:—

The sheet mill of the Sharon Iron Works, Sharon, Pa., has resumed.

The Totten & Hogg Iron & Steel Foundry Co., of Pittsburg, manufacturer of rolling mill engines and machinery is now at work on a pair of reversing engines and a special train of

rolls which they are building for the Ironton Structural Steel Co., of Duluth, Minn.

The New Castle, Pa., rod mill, which has been shut down for some time, has resumed operations.

The Pittsburg Forge & Iron Co. has ordered 31 puddling furnaces started at Verner station, Allegheny.

The Ohio Steel Co.'s plant at Youngstown, O., closed down Feb. 8 and will remain idle for about 10 days.

Napier furnace (charcoal), at Napier, Tenn., has just been put in blast, after a shut-down of several months.

The Anniston (Ala.) Iron & Steel Co. will put its rolling mill in operation shortly. About 200 men will be employed.

Top fillers at the Jefferson furnace, Steubenville, O., struck last week because of a reduction of the force. Their places were filled.

George Rupley has leased the rolling mill and blacksmith shops of the Duluth Mfg. Co., Duluth, Minn., and has put the mill in operation on contracts.

It is reported that the Oxford Iron & Nail Co., at Oxford, N. J., will resume operations very soon. The concern went into the hands of a receiver about a year ago and the works shut down.

One of the furnaces of the Shoenberger Steel Co. has had its stoves heightened about 15 feet and has been blown in. The other furnace will probably have its capacity increased in the same way.

Chas. B. Colby and P. R. Foley of Philadelphia, have purchased the car works at Dauphin, Pa., and will make the alterations necessary to carry on the manufacture of bridges and structural iron.

Rudolph Ehrhart & Co., Monadnock Blk., Chicago, have just placed an order with Willis Shaw, 416 N. Y. Life Bldg., Chicago, for rock drilling machinery for use on their contract work at Riverside, Ill.

The Pultney Foundry & Engineering Works, of Youngstown, has been incorporated. The capital stock is placed at $50,000. Hydraulic machinery, blowing engines and the Pultney valve are manufactured.

J. W. Morrison, Jr., has again taken charge of the foundry department of the Morrison Foundry & Machine Works, of Youngstown, O., Messrs. McCurdy and Miller having gone out of the business. Extensive changes, including a new crane and new core ovens, are being made.

In the bridge and construction department of the Pennsylvania Steel Co., at Steelton, Pa., shipment is being made of the material for the second section of the Boston subway, comprising about 1,000 tons of structural material, mostly T beams. The company has recently received a contract for 1,500 tons of T rails from the Cumberland Valley Railroad Co.

The Globe Iron Works, of Cleveland, has installed a Whiting cupola of 14 tons hourly capacity in its foundry. The Whiting Foundry Equipment Co., Chicago, also recently shipped to Sam'l L. Moore & Sons Co., Elizabeth, N. J., a No. 10 Whiting cupola having a capacity of 25 tons per hour; to the Mansfield Machine Works, Mansfield, O., one No. 3 Whiting cupola, having an hourly capacity of five tons.

Quite an extensive order for hoisting machinery was placed last week with Willis Shaw, 416 New York Life Bldg., Chicago. The order includes 12 engines, with the boilers for same, and their necessary equipments. These hoists will be used in the construction of the retaining wall of the Chicago Drainage Canal. Mr. Shaw has placed this order with the Pen Argyl Iron Works, of Pen Argyl, Pa., for early March delivery.

Among additions to the equipment of the W. Dewees Wood Co., McKeesport, Pa., is a 75-ton steam hammer. The anvil alone weighs 55 tons. It was made at Alliance, O., and shipped on an eight-truck car. It will have a striking power of 75 tons. The old drop pattern hammer now in use will be discarded. The addition to the trimming house of the same plant is rapidly nearing completion, and two new annealing furnaces have been completed.

Locomotive building: The Wheeling & Lake Erie has placed 10 locomotives with the Cooke works, Paterson, N. J. The Lehigh valley will order five freight engines. The Cincinnati, Jackson & Mackinaw will probably order five freight engines. At the Altoona and Juniata shops of the Pennsylvania Road, 38 locomotives will be constructed. Ten mogul locomotives are to be built by the Brooks Locomotive Works for the Illinois Central.

The Westinghouse Electric & Mfg. Co., of Pittsburg, recently shipped two of the largest electrical generators for the operation of an electric railway ever turned out. These ma-

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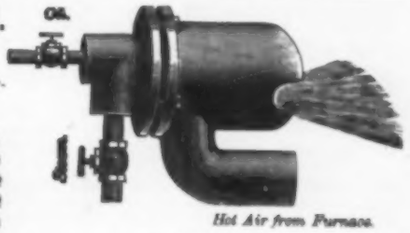

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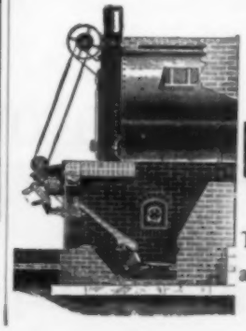

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chines were of 1,500 h. p. each, and they were contracted for by the Nassau Electric Railway Co., of Brooklyn, N. Y. Last summer the Westinghouse Co. constructed and delivered to the same company three generators of 750 h. p. capacity each, making the total capacity of the electric railway plant 5,250 h. p., one of the largest in the country. The new generators are of the style known as engine-type, being direct connected to a Cooper-Corliss engine running at a speed of 75 r. p. m.

The Excelsior Mfg. Co., operating an extensive stove foundry at St. Louis, made an assignment Feb. 6 Several years of bad business and lack of ready money led to the step. The assets include $280,000 worth of stock on hand; liabilities are not stated. A mortgage on pig iron for $67,600 was given to the State bank; one on sheet iron to Robt. E. Filley, for $2,985; one on stock, for $55,500, to Giles F. Filley, president of the company, to secure notes endorsed by him, were filed previous to the assignment, and a deed of trust to president Filley, for $55,000, on real estate. The Excelsior Mfg. Co., was the outgrowth of the firm of Giles F. Filley & Co., founded in 1849.

James E. York, general manager of the Ironton Structural Steel Co., Duluth, which has completed two 30-ton acid open-hearth furnaces and a beam mill designed to roll beams up to 36 inches makes this statement: "We contemplate spending at once $100,000 in further improvements. We shall build a 30-ton basic open-hearth furnace, which will give us 700 tons a week capacity in our steel making department. We shall put in a 36-inch blooming mill with engines. We shall extend our finishing department and put in an electric generator plant to furnish power to drive all our cranes and finishing machinery. We shall then be in position to make at least 150 tons of finished shapes per day. Our hopes have been fully realized by the York universal beam mill in rolling various sized beams and intricate shapes."

The Berlin Iron Bridge Co., of East Berlin, Conn., has just completed a successful year. Shipments were the largest in the history of the company, and are represented by over $1,500,000 worth of business. At the annual meeting of the stock holders, held at the office of the company on Thursday, Jan. 30, the following directors were elected: Chas. M. Jarvis, Burr K. Field, Geo. H. Sage, H. H. Peck, of Waterbury, S H. Wilcox, of Brooklyn, N. Y., J. W. Burr, and F. L. Wilcox. At the meeting of the directors the following officers were elected: President and chief engineer, Chas. M. Jarvis; vice-president, B. K. Field; secretary, Geo. H. Sage; treasurer, F L. Wilcox; manager of the highway bridge department, D. E. Bradley; assistant to the president, E. W. Stearns.

H. E. Collins & Co., Pittsburg, sole sales agents for the Cahall vertical water tube boiler, manufactured by the Aultman & Taylor Machinery Co., Mansfield, O., report the following recent sales of Cahall boilers: National Chemical Co., Cleveland, 150 h. p.; Republican Iron Works, Pittsburg (fourth order) 250 h. p.; Municipal electric lighting plant, London, O., 250 h. p.; Voigt Brewing Co., Detroit, 500 h. p.; Michigan Alkali Co., Wyandotte, Mich. (fourth order) 300 h. p.; Jefferson Coal Co., Coal Glen, Pa., 500 h. p.; Ohio Iron Co., Zanesville, O., 500 h. p. The boilers for the Republic Iron Works are for the utilization of waste heats from heating furnaces; those for the Ohio Iron Co. are for blast furnace gas and the balance of the orders mentioned are for boilers of the direct coal-fired type. Collins & Co. have just issued a circular showing the results of a comparative test made on the Cahall and other leading types of boilers, which would prove interesting to intending purchasers.

Low Rates to New Orleans and Mobile.

February 13th to 16th, inclusive, excursion tickets will be sold via Pennsylvania Lines to New Orleans and Mobile for the Mardi Gras festivities. Tickets will be valid returning fifteen days from date of sale. For details, apply to nearest Pennsylvania Line Ticket Agent.

Steam Yachts and Marine Machinery,

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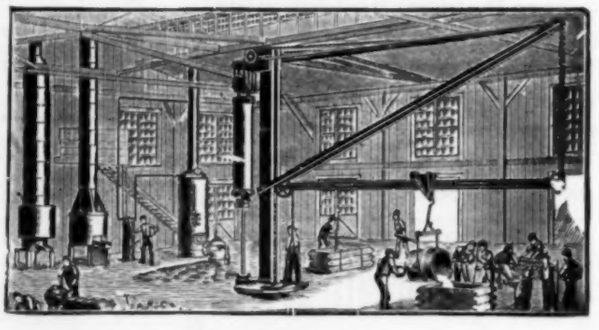

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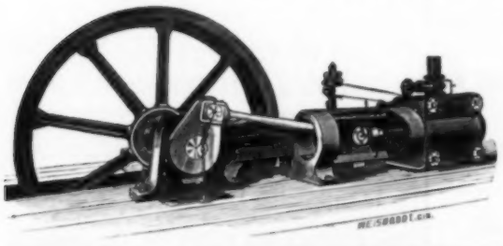

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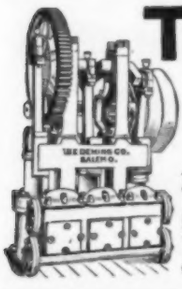

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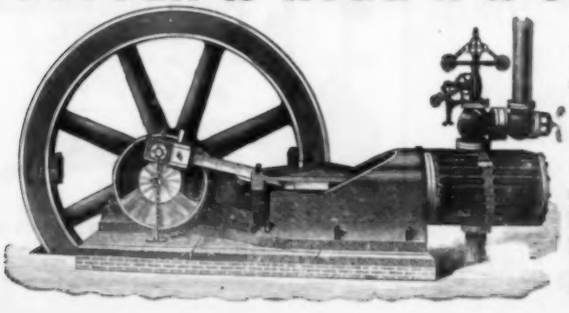

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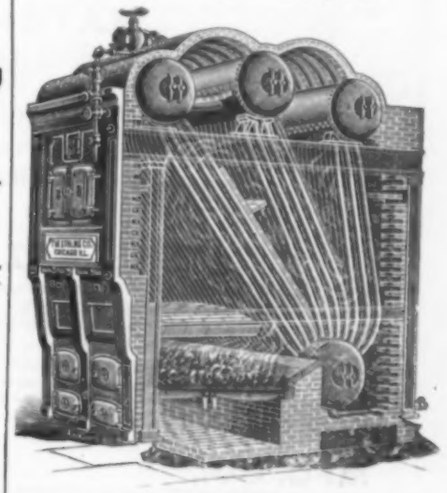

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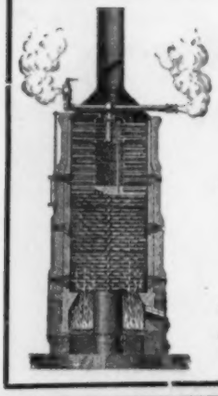

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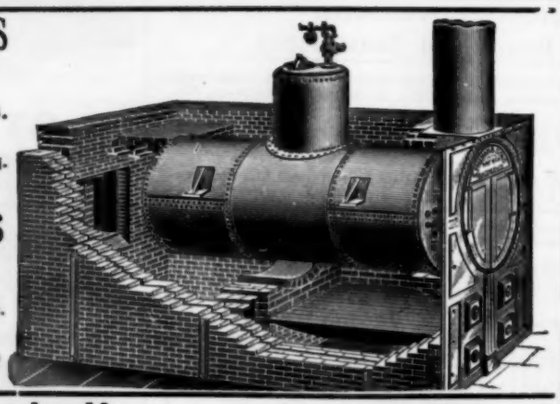

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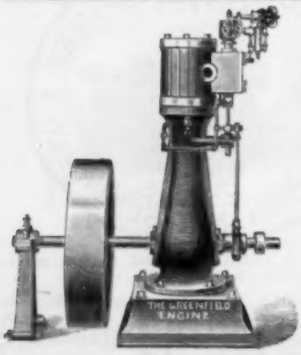

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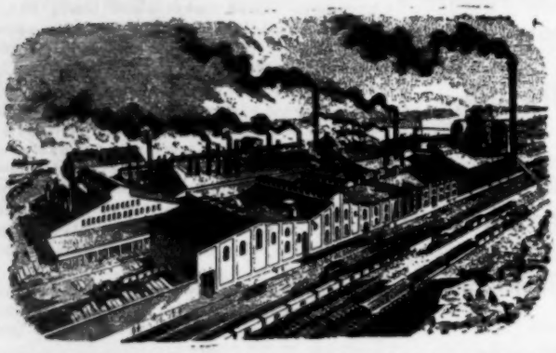

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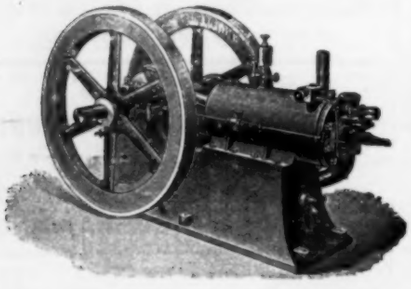

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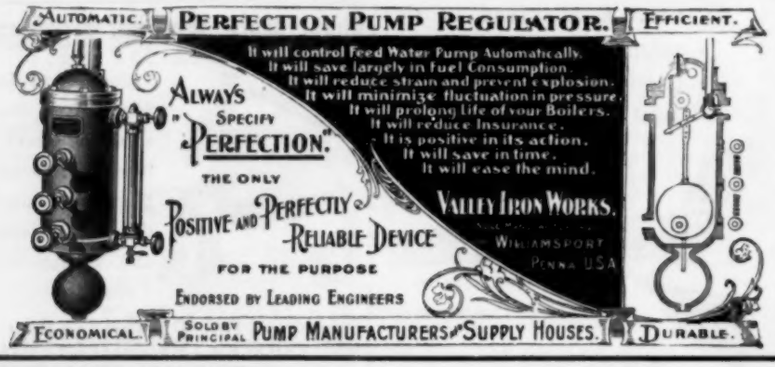
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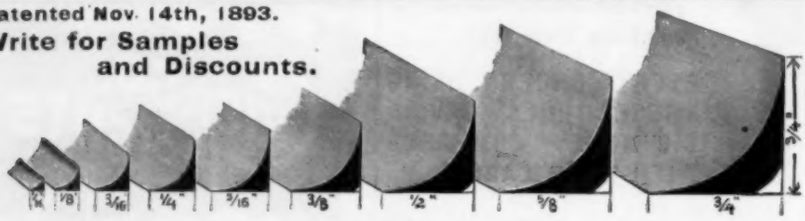

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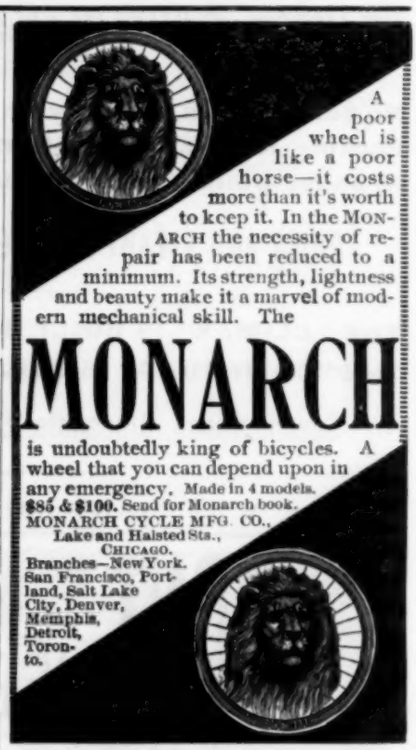

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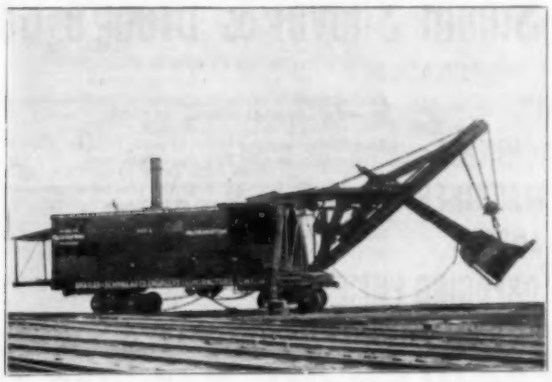

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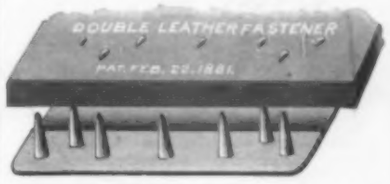

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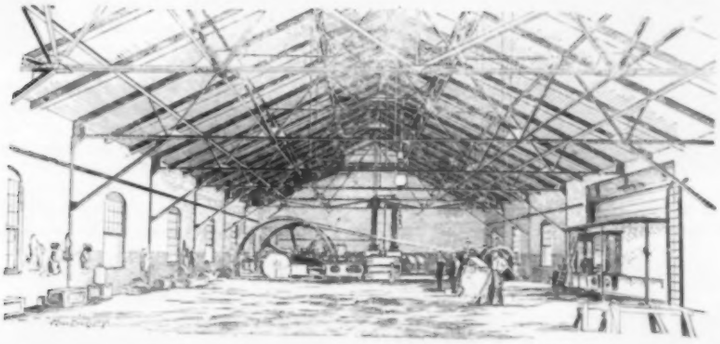

The above illustration is taken direct from a photograph and shows the interior of an Engine Room or Power House, which was designed and built by us for the Scranton Traction Co., at Scranton, Penn. The building is 60 ft. wide and 120 ft. long, the frame work being entirely of steel. Between the steel side posts is placed a light brick wall to protect the interior from the weather, and ventilation is secured by a monitor the full length of the building, with swinging sash on the sides. The roof is covered with slate secured to the roof plank.

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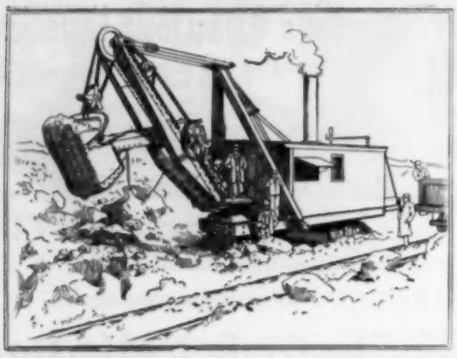

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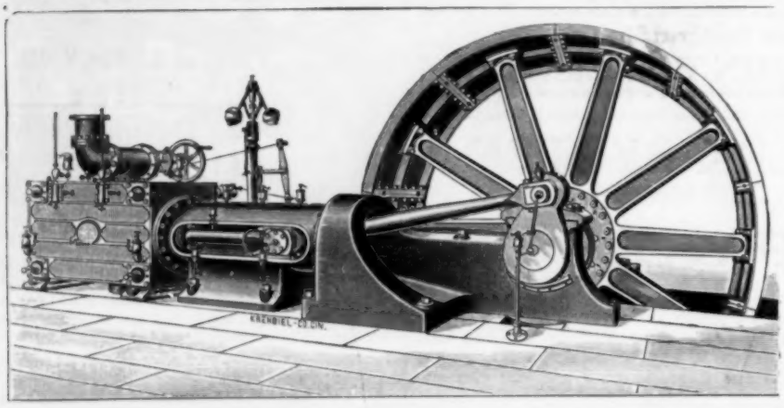

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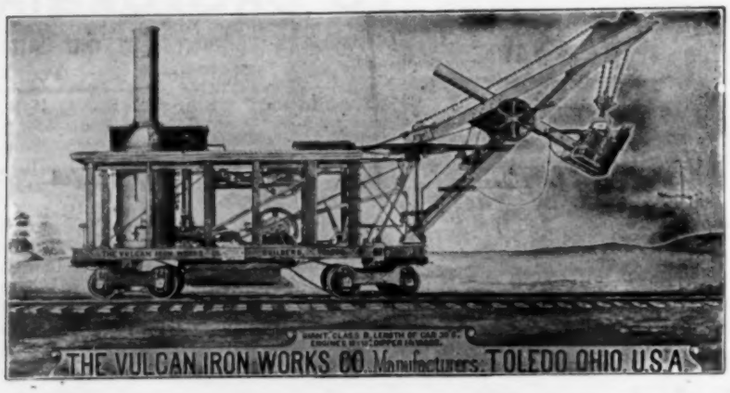

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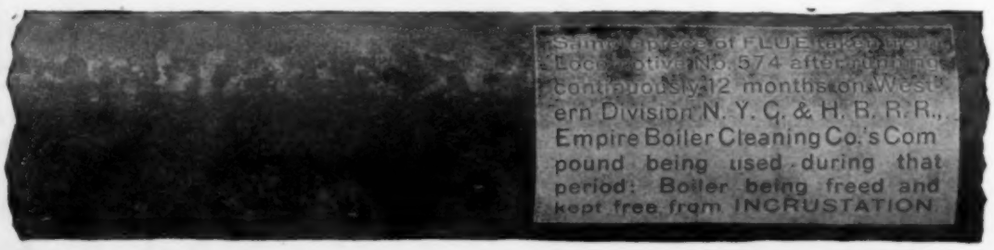
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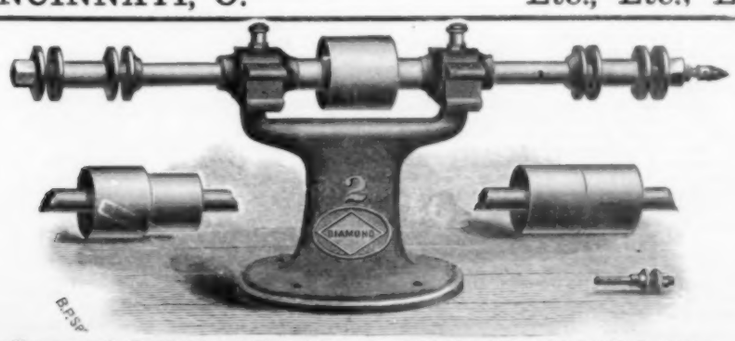

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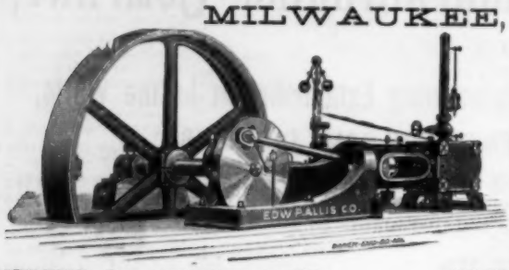

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Ohio Strong Softeners	15 00@ 15 50
Alabama Car Wheel	17 50@ 18 00
Malleable Bessemer	
Coke Bessemer	

CINCINNATI (reported by Rogers, Brown & Co.)

Southern Coke No. 1, Foundry	$11 50@$11 75
Southern Coke No. 2 and No. 1 Soft	11 50@ 11 75
Hanging Rock Coke, No 1	12 50@ 13 50
Hanging Rock Charcoal No. 1, Fdy	16 00@ 17 00
Tennessee Charcoal No 1	13 50@ 14 00
Jackson County Silvery No 1	14 00@ 15 00
Southern Coke, Gray Forge	10 25@ 10 75
" " Mottled	10 00@ 10 50
Standard Alabama Car Wheel	15 75@ 16 25
Tennessee " "	14 50@ 15 00
Lake Superior " "	15 75@ 16 25

BUFFALO (reported by Rogers, Brown & Co.)

No. 1 Foundry Strong Coke Iron Lake Superior Ore	$13 50
No. 2 Foundry Strong Coke Iron Lake Superior Ore	13 00
Ohio Strong Softener No. 1	13 70
Jackson Co. Silvery No. 1	15 25@ 15 75
Lake Superior Charcoal	14 50@ 15 50
Southern Soft No. 1	12 90
Hanging Rock Charcoal	18 50

ST. LOUIS (reported by Rogers, Brown & Mecham):

Southern Coke No 1	$12 25
Southern Coke No. 2	12 00
Southern Coke No. 3	11 75
Southern Gray Forge	11 25
Southern Charcoal No. 1	14 50@ 15 00
Missouri Charcoal No. 1	14 00@ 15 00
Ohio Softeners	16 00@ 17 00
Lake Superior Car Wheel	17 00@ 17 50
Southern Car Wheel	16 50@ 17 00

OLD RAILS AND SCRAP METAL.

	Gross Tons
Old iron rails	$17 00
Old steel rails	12 50
Old car wheels	13 00
	Net Tons
No. 1 R. R. wrought scrap	$12 00
Mill scrap	9 50
No. 1 Machine cast scrap	10 00
Iron axles	16 00
Axle turnings	9 00
Wrought turnings (free from cast)	8 50
Cast borings	7 50
Uncut wrought iron boilers	5 00
Steel boiler plates	10 00
Grate bars	6 50
Pipes and flues (clean)	8 50
Tank iron	9 00
Hoop and band iron	7 00
Sheet iron	6 50
Wrought drillings	7 50
Malleable iron	9 00

STRUCTURAL MATERIAL.

Beams and Channels (Cleveland mill)	1.49c@1.54c	
Angles	1.34c@1.39c	
Tees	1.49c	
Universal Plates	1.45c	
Sheared Plates	1.55c	

MERCHANT IRON AND STEEL.

[List prices out of store.]

Flat Bar.

1½ to 4 by ⅜ to 1 inch	1
1½ to 6 by ⅜ to 1 inch	1
1¾ to 6 by 1½ to 2 inch	1 65
1¼ & 1⅜ by ⅜ to ¼ inch	1 40
1 & 1¼ by ⅜ to ¼ inch	1 50
⅛, ⅝, ⅞, by ⅜ to ¼ inch	1 60

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Geo. H. Bowler, Sec'y and Treas
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The most Marvelous Lubricant Known.
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NOT AFFECTED BY HEAT, COLD, STEAM OR ACIDS.
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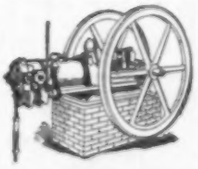

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Iron Clad Paint Co.
And get the genuine article, and save liability of suit for using an article made in violation of the patents issued to Wm. Green, and now owned by this Company.
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USED BY NEARLY ALL THE RAILROADS.

Round and Square.

1 to 1⅞ inch	1 40
2 to 2⅝ inch	1 60
2⅝ to 3¼ inch	1 55
3⅜ to 4 inch	1 90
4⅛ to 4⅝ inch	2 50
4¾ to 5 inch	2 70

Oval.

⅜ to 1¼ inch	1 60
½ to ¾ inch	1 80
½	1 80
⅝	2 00

Half Oval and Half Round.

1¼ to 3 inch	1 95
⅜ to 1¼ inch	1 75
½ to ¾ inch	2 00
⅝	2 15
⅜	3 75

Heavy Band.

1¼ to 6 by ¼ and 5-16 inch	1 50
1 to 1⅜ by ¼ and 5-16 inch	1 55
⅜ to ⅝ by ¼ and 5-16 inch	1 65
½ to ⅝ by ¼ and 5-16 inch	1 90

Hoop Iron.

1 7-16 to 4, No. 13, 14, 15 and 16	1 75
1 7-16 to 2, No. 17, 18 and 19	1 85
1 7-16 to 2, No. 20	1 90
1 7-16 to 2, No. 21	2 00
1 7-16 to 2, No. 22	2 10
1⅛ to 1⅜, No. 13, 14 and 15	1 80
1⅛ to 1⅜, No. 16, 17 and 18	1 85
1⅛ to 1⅜, No 19 and 20	1 90
1⅛ to 1⅜, No. 21	2 00
1⅛ to 1⅜, No. 22	2 10
15-16 and 1 inch, No. 13, 14 and 15	1 75
15-16 and 1 inch, No. 16, 17 and 18	1 90
15-16 and 1 inch, No. 19 and 20	2 00
15-16 and 1 inch, No. 21	2 10
15-16 and 1 inch, No. 22	2 20
⅞, No. 13, 14 and 15	2 00
⅞, No. 16, 17 and 18	2 10
⅞, No. 19 and 20	2 20
⅞, No. 21	2 30
⅞, No. 22	2 40
13-16, No. 13, 14 and 15	2 10
13-16, No. 16, 17 and 18	2 20
13-16, No. 19 and 20	2 30
13-16, No. 21	2 40
13-16, No. 22	2 50
¾, No. 13, 14 and 15	2 20
¾, No. 16, 17 and 18	2 35
¾, No. 19 and 20	2 45
¾, No. 21	2 55
¾, No. 22	2 65
11-16, No. 13, 14 and 15	2 45
11-16, No. 16, 17 and 18	2 50
11-16, No. 19 and 20	2 60
11-16, No. 21	2 70
11-16, No. 22	2 80
11-16, No. 23	2 90
⅝, No. 13, and 15	2 50
⅝, No. 16, 17 and 18	2 60
⅝, No. 19 and 20	2 70
⅝, No. 21	2 80
⅝, No. 22	2 90
⅝, No. 23	3 00
9-16, No. 13, 14 and 15	2 70
9-16, No. 16, 17 and 18	2 80
9-16, No. and 20	3 90
9-16, No. and	2 00
9-16, No. 221	3 10
9-16, No. 22	2 20
7-16 and ½ inch, No. 13, 14 and 15	3 90
7-16 and ½ inch, No. 16, 17 and 18	3 00
7-16 and ½ inch, No. 19 and 20	3 10
7-16 and ½ inch, No 21	3 20
7-16 and ½ inch, No. 22	3 30
7-16 and ½ inch, No. 23	3 40
½, No. 13, 14 and 15	3 40
½, No. 16, 17 and 18	3 50
½, No. 19 and 20	3 60
½, No. 21	4 90
½, No. 22	4 00
½, No. 23	4 15

Light Band.

1⅜ to 6 by ⅛ to 3-16 inch	1 60
1⅛ to 6 by Nos. 11 and 12	1 65
1 to 1⅜ by ⅛ to 3-16 inch	1 65
1 to 1⅜ by Nos. 11 and 12	1 70
⅞ and 13-16 by ⅛ to 3-16 inch	1 80
⅞ and 13-16 by Nos. 11 and 12	1 75
¾ and 11-16 by ⅛ to 3-16 inch	1 90
¾ and 11-16 by Nos. 11 and 12	1 95
⅝ and 9-16 by ⅛ to 3-16 inch	2 05
⅝ and 9-16 by Nos. 11 and 12	2 10
½ by ⅜ to 3-16 inch	2 20
½ by Nos. 11 and 12	2 25

Wagon Box iron.

⅞ inch, beveled edge, by Nos. 11 and 12	1 80
⅞ inch, " " " " 13 and 14	1 90
¾ inch, " " " " 11 and 12	1 93
¾ inch, " " " " 13 and 14	1 35

Sheet Iron.

No. 10	1 65
No. 12	1 70
No. 14	1 80
No. 15-17	1 90
No. 18	2 05
No. 20	2 20
No. 22-24	2 30
No. 25-26	2 40
No. 27	2 50

Steel Boiler Plates—1-4 in. and Heavier.

Tank	1 45
Shell	1 60
Flange	1 70
Marine Flange	2 00
Fire Box	2 50

Above includes plates 90 inches wide.

90 to 96 in. wide	½c. lb. extra
96 to 100 in. wide	1 c. "
100 to 104 in. wide	1½c. "
104 to 106 in. wide	special

American Cast Tool Steel.

ROUND, SQUARE AND OCTAGON.	cts. lbs.
1 to 2 in. inclusive	08
9-16 to ⅞ in. "	08

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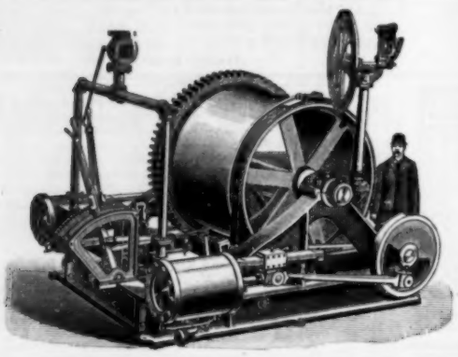

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POCAHONTAS FLAT-TOP COKE.

So low in ash that it requires no fluxing for foundry purposes. Our foundry and furnace coke was awarded the first premium at the World's Fair in 1893.

AVERAGE ANALYSIS OF COKE.

Moisture	00.196	Sulphur	00.677
Fixed Carbon	93.625	Ash	05.004
Volatile Matter	00.494		

Foundry, Furnace and all sizes of crushed coke. Guaranteed lower in Sulphur than any other commercial coke

STEEL CASTINGS

FROM 10 LBS. UPWARD.

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COMBINE SAFETY WATER TUBE BOILER

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FRICTION CLUTCHES, HANGERS, PILLOW BLOCKS & PULLEYS.

Large Stocks on Hand. Shipments Promptly Made.

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7-16 to ⅜ and 2⅜ to 3 in.	.09
3⅜ to 4 in.	.09½
⅜ to 11-16 and 4⅜	.10
⅝ to 6 in.	.10½
⅝ to 9-32 and 6⅝ to 7 in.	.11
7 in	.13

Flats.

	cts. ℔s
2 to 9-16 in. wide by 2 to ⅝ thick	.8

Bessemer and O. H. Steel.

Bessemer Machinery	base price, 1 50
Open-hearth Tire	" 1 80
Open-hearth Spring	" 2 20
Sleigh Shoe	" 1 90
Toe Calk	" 2 10
Cutter Shoes, tapered and bent	" 2 20

English Tool Steel.

Jessop's	15½c
Hobson's "Best"	15½c
" "Choice"	35c

Burden Boiler Rivets.

½, ⅝, 11-16 and ¾ inches diameter	3 30
Bridge ½, ⅝, 11-16 and ¾ inch diam	3 00

Wrought Pipe and Boiler Tubes.

Lap weld black, base	dis. 65
Butt " " "	dis. 55
Lap " galv. "	dis. 52½
Butt " " "	dis. 50
Boiler tubes 2¼" and smaller	dis 62½
Boiler tubes 2½" and larger	dis. 65
Casing screw and socket joint	dis. 52½
Casing inserted joint	dis. 47½

MACHINERY SUPPLY MARKET.

Anvils.

American	℔ 9@10
Wright's	℔ 12

Bellows.

Blacksmiths' Hill's	dis 40
Blacksmiths' Bullock's	dis 50&10
Moulders'	dis 40@40&10
Hand	dis 40&10@50

Belting.

Boston Belting Co.'s standard	dis 70
" " " extra	dis 60&5
" " " best	dis 55
Cleveland Rubber Co. extra standard	dis 60&10
Hoyt's Short Lap	dis 45
Shultz Raw Hide Leather Belting, single,	dis 40
Munson's Short Lap Single Leather	dis 50
Munson's Short Lap Double and Light Double Leather	dis 50&10
Shultz Raw Hide Leather Belting, Double and Light Double	dis 40
Standard, oak tanned	dis 50&10
Alexander Brothers' pure oak tanned	dis

Blowers and Exhausters.

B. F. Sturtevant's	dis 20
Boston Blower Co.,	dis 35
Buffalo	dis 40

Chucks.

Cushman's 4 Jaw Independent	dis 45
" Combination	dis 40
" Geared Scroll	dis 30
" 2 Jaw Brass Workers	dis 30
" Drill	dis 35
Wescott's Scroll Combination	dis 33⅓
" Independent	dis 40
" Little Giant Drill	dis
Horton's Universal	dis
" Independent	dis 45
Whiton's Independent	dis 45
National Combination	dis 40
Sweetland "	dis 40
Almond Drill	dis 20
Morse "	dis 15
Skinner's Combination Lathe	dis 40&10
" Independent Lathe	dis 40&10
" Universal Lathe	dis 40&10
" Drill	dis 20

Cutters and Reamers.

Cleveland	dis 10@15
Pratt & Whitney	dis 10@15
Standard	dis 10@15
Morse	dis 15
Brown & Sharpe, Milling Cutters	dis
" " Gear Cutters	dis

Crowbars.

Cast Steel	℔ 3½
Iron, steel points	℔ lb 3

Drill and Drill Sockets.

Twist Drills	dis 50&10
Morse Taper and Straight Shank to 1⅝"	dis 50&10
Morse Taper and Straight Shank Larger than 1⅝"	dis 25
Drill Sockets	dis 25
Standard Twist Drills	dis 55@55&5
Cleveland " "	dis 55@55&5

SHIFFLER BRIDGE COMPANY,

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SPECIALTIES: STEEL AND IRON BUILDINGS FOR ROLLING-MILLS TIN PLATE PLANTS, STEEL WORKS, FOUNDRIES, FACTORIES, ROOF TRUSSES, GIRDERS, COLUMNS, BEAMS, CORRUGATED IRON, ETC.

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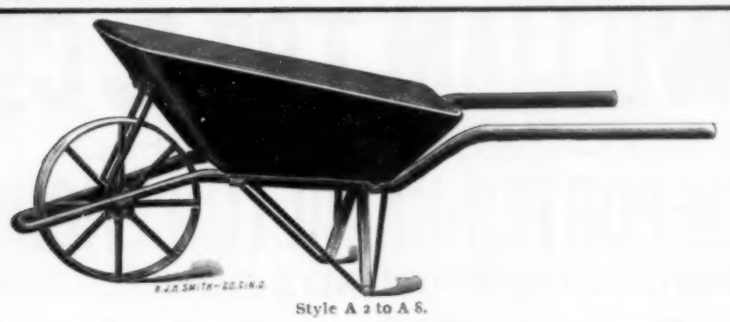

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THE PLAYFORD STOKER

A perfect smoke preventing furnace; perfect combustion, minimum of expense, simple in construction and economical.

A test of three tubular boilers of Cleveland Water Works, made Oct. 4th, 1895, by a waterworks engineer, shows an evaporation of over ten pounds of water to one pound of nut coal, and during the test the stack was entirely free from smoke.

The PLAYFORD STOKER CO., 919 SOCIETY FOR SAVINGS CLEVELAND, O.

Semi-Steel Castings

34,000 TO 38,000 TENSILE STRENGTH.

Process Owned by

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Pittsburgh and Bellaire	† 7:00 am	†12:10 pm
Salem and Pittsburg	* 8:00 am	* 8:30 pm
Pittsburgh, Bellaire and East	†12:45 pm	† 6:25 pm
Philadelphia and New York	* 1:40 pm	*11:25 am
Baltimore and Washington	* 1:40 pm	*11:25 am
Alliance and Pittsburgh	* 1:40 pm	*11:25 am
Ravenna and Alliance	* 5:00 pm	* 8:30 am
Philadelphia and New York	*11:10 pm	* 5:25 am
Baltimore and Washington	*11:10 pm	* 5:25 am
Alliance and Pittsburgh	*11:10 pm	* 5:25 am

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FROM CLEVELAND TO	LEAVE	ARRIVE
Xenia and Cincinnati	* 8:10 am	* 5:45 pm
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	Arrive.	Depart.
Valley Jctn. & Way Stations	*6:30 P M	*7:10 A M
Akron, Canton & Valley	*10:10 A M	*3:15 P M
Akron, Canton & Chicago	*8:10 A M	*6:30 P M
Akron, Canton & Worcester, Defiance, Garrett, Marietta, Wheeling, Washington, D. C., and Baltimore	†2:55 P M	†11:00 A M

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	No. 4 to No. 54 46 gr.	No. 54 to Flour, 150 gr.	C. F. F. FF.
Kegs, ℔ lb	4½c	5 c	2½c
½ kegs ℔ lb	4¾c	5¼c	2¾c
¼ kegs ℔ lb	5 c	5½c	3 c
10 lb cans, 10 in case	6 c	6¼c	5 c
10 lb cans less than 10	10 c	10 c	7½c

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Barder, Adamson & Co. ..... dis 50@50&5
H. H. Barton ..... dis 50@50&5

Emery Wheels.

Detroit ..... dis 60@70
Norton's ..... dis 60@70
Grant ..... dis 60@70
Sterling ..... dis 60@70
Celluloid ..... dis 10&33⅓
Northampton ..... dis 55
Crystal ..... dis 65@70
Vitrified ..... dis 60@70
Vulcanite ..... dis 60&10
Hamden ..... dis 60&10@70
Cyclone ..... dis 60@60&10

Files.

Arcade ..... dis 60&10@60&10&10
Nicholson ..... dis 60&10@60&10&10
" X. F ..... dis 25
Kearney & Foot ..... dis 60&10@60&10&10
Black Diamond ..... dis 60&10@60&10&10
McClellan ..... dis 60&10@60&10&10
Disston's ..... dis 60@70
Western ..... dis 70
Stub's ..... dis 25
Grobet's ..... dis 30
Reynolds Bros.' Hand Cut ..... dis 50
Industry File Works Hand Cut ..... dis 50

Hammers.

P. S. W ..... dis 40
Atha new list, Jan. 15, 1887 ..... dis 50
Heavy hammers and sledges under 5 lbs 12c
" " " " over 5 lbs 10c

Jack Screws.

Illinois Bolt Co. list ..... dis 75

Nuts and Washers.

Size of bolt inches	¼	5-16	⅜	½	⅝	¾	1
Square	8	7	5½	4¾	4	3½	3⅛
Hexagon	15½	11⅛	8¼	6	5⅛	5¼	
Washers	9	8	7	5	4½	4½	4⅛

In lots less than 100 lbs, ℔ lb add ½c., 1 lb boxes add 1c to list.

Nails (wire).

List July 14, 1887 ..... dis 85
Standard Penny Nails, ℔ keg card rate
{ Car lots $2 75
{ Less than car lots $2 35

Oilers.

Zinc and Tin ..... dis 60
Brass and Copper ..... dis 50
Malleable (Hammer's), No. 1, $3.60; No. 2, $4.00; No. 3, $4.40 ℔ doz ..... dis 10&10&10

Picks.

Railroads, 5 to 6 lbs ..... $12 dis 60
" 6 to 7 lbs ..... $13 dis 60

Pulleys.

Iron Pulleys, Walker List ..... dis 50
Medart Pulleys ..... dis 50
Split Wood Pulleys ..... dis 55@60

Pulley Blocks.

Moore's Anti-Friction Differential Chain Pulley Block ..... dis 20

Rivets.

Iron, Thousand, list November 1, 1894 ..... dis 60@65
Iron, Ordinary, Cooper's Block and Carriage list November 1, 1894 ..... dis 60@65
Copper ..... dis 50@50&10

Taps.

Cards, Hand and Nut to 2 in ..... dis 50
Carpenters' " " " ..... dis 50
Morse " " " ..... dis 50
Pratt & Whitney " " new list ..... dis 10
Machine Screw Taps ..... dis 55
Pipe Taps to 2½ in ..... dis 70
Stay Bolt Taps ..... dis 25
Stove Bolt Taps ..... dis 55
Pulley Taps ..... dis 40

Vises.

Solid Box ..... dis 60
Parker's ..... dis 20@25
Prentiss ..... dis 20
Stephen's ..... dis 25@30
Barrett's ..... dis 30
Miller's Falls ..... dis 40
Merrill's ..... dis 15@20
Howard ..... dis 35

Wire.

New List, Apr. 9, 1894

Brass ..... dis 40
Copper ..... dis 40
Bright and annealed, Nos. 0@18 ..... dis 70&10@75
" " Nos. 19@26 ..... dis 75@75&5
" " Nos. 27@36 ..... dis 75&10&5
Coppered Nos. 0 to 18, market list ..... dis 70@70&5
Galvanized Nos. 0 to 18 " " ..... dis 65&5
Tinned market Nos. 0 to 18 ..... dis 67½
Cast steel ..... dis 50
Tinned Broom Wire ..... dis 70&5@70&10
Annealed Fence, Nos. 8 and 9 ..... dis 75
Annealed Grape, Nos. 10 to 14 ..... dis 75
Stub's Steel Wire regular ..... 95c ℔ lb dis 30

Wrenches.

Coe's genuine ..... dis 50
Girard Standard ..... dis 70&10
Agricultural ..... dis 75&10
Mechanic's ..... dis 55&10&5
Bemis & Call's Combination ..... dis 35
Donohue's Engineers ..... dis 20&10
Lamson & Sessions Engineers ..... dis 60
Billings & Spencer's Drop Forged ..... dis 25
William's " " ..... dis 25
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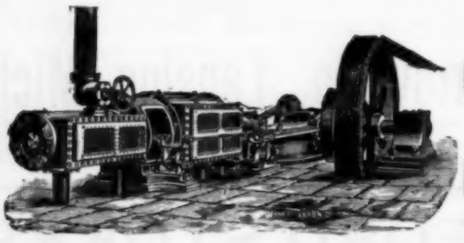

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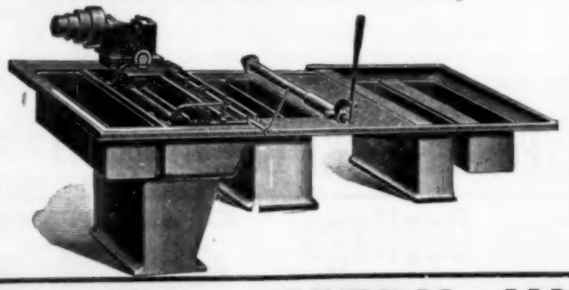

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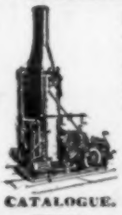

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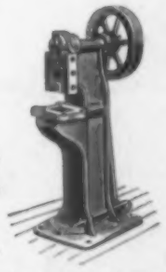

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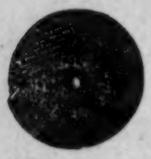

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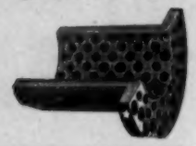

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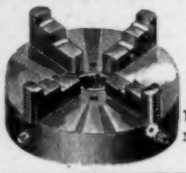

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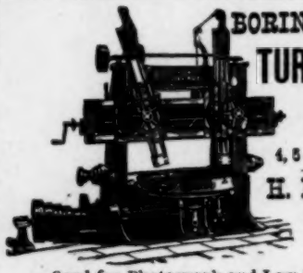

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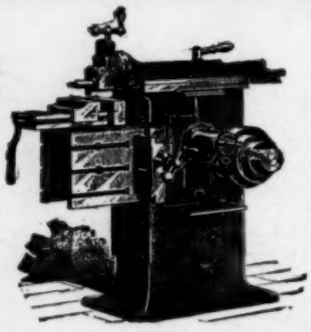

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